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Prices Approach the 1899 Level

Plates, Shapes, Bars and Many Minor Products Advanced—New Quotations Are Largely Academic—Railroads Buy Heavily and Pig Iron Market Wakes Up

THE effect of a horizontal boost of $5 a ton in the prices of major steel products, announced last Friday, has been much less startling than would be the case in a market unaccustomed to the pyrotechnics of a war boom. The new quotations, which are for future delivery at the convenience of the mill, bring plates up to 2.35c, and shapes and bars to 2.25c, Pittsburgh. These figures are within easy hailing distance of those marking the summit of the abrupt rise that placed the year 1899 in a class by itself in the history of the American iron and steel trade; during that period, which, strangely enough, seemed to grow directly out of our *opera bouffe* war with Spain, plates climbed to 2.80c, and shapes and bars to 2.50c, Pittsburgh, on contract. Almost immediately after the first announcement of the recent advance, which was initiated by the Steel Corporation, the new prices were adopted by the leading independents, east and west.

Price Advances

Owing to the fact that many large consumers are well covered for the remainder of the year, and also because the new price schedule is appreciably below current quotations for immediate or early delivery, the recent increase is as much a reflection of the sold-up condition of the mills as an indication of further demands on the part of buyers. The latter, however, are clamorous. Nevertheless, their willingness to commit themselves would have more weight if it were not for the widespread policy of protecting customers against a decline. In addition to plates, shapes and bars, many other products have been advanced sharply within the past few days. Structural rivets have gone up to 3c, Pittsburgh, and boiler rivets to 3.10c. Light rails have been advanced $3 a ton, to 1.85c, Pittsburgh, covering the range of sizes between 25 and 45 pounds per yard. Track bolts, which were 2.50c, are now 3.25c, Pittsburgh, and spikes have been advanced $3 a ton, to 2.50c. Hoops and bands advanced $5, in sympathy with bars. Warehouse prices took a similar course. No. 28 gage black sheets are now 2.60c, Pittsburgh, minimum. Spiegeleisen has jumped to $50 at the furnace. Nuts and bolts have gone up 10 per cent.

Pig Iron

After several weeks aimless drifting, the pig iron market has taken on a new and vigorous lease on life, particularly in central western territory, where exceptionally heavy sales have been made. On a purchase of 20,000 tons of bessemer, the Youngstown Sheet & Tube Co. forced the price down to $20, valley, a decline of about 50 cents. The same concern purchased 5,000 tons of gray forge at $17.50, valley, both grades being for shipment before July 1. It is believed the bessemer market will shortly work its way back to the $21 basis. The Portsmouth Steel Co. has contracted for between 30,000 and 40,000 tons of southern Ohio basic at $18, furnace; the American Rolling Mill Co. is understood to have taken 25,000 tons of basic for last half shipment from Columbus and Toledo furnaces. The Scullin-Gallagher Iron & Steel Co., St. Louis, has purchased 15,000 tons of basic and the Kokomo Steel & Wire Co. is in the market for 35,000 tons. There is considerable sub-surface activity in the east, where prices show a firmer trend. Chicago producers are considering inquiries aggregating 50,000 tons.

Railroad Buying

Railroads are active buyers and the Pennsylvania has succeeded in placing a portion of its 25,000-ton inquiry for car plates. The New York Central lines have closed for 150 locomotives and are figuring on 250 more. The Long Island railroad has purchased 8,000 tons of rails from the Bethlehem Steel Co., and the Central Railway of Georgia has executed a contract with the Tennessee Coal, Iron & Railroad Co. for 10,000 tons. The Alaska engineering commission, Seattle, shortly will take bids on 15,000 tons of open hearth rails and 7,000 kegs of spikes. The Chicago & Northwestern is in the market for from 3,500 to 4,000 cars and several locomotives.

THE OPEN HEARTH

Grasping War's Opportunity

MANY changes and adjustments of American manufacturing practice and production have been brought about by the necessities and opportunities arising from the European war. The question that now most concerns manufacturers and students of new conditions is as to which of these outgrowths of an extraordinary time are likely to become permanent features of trade and production. The iron and steel industry is witnessing its share of these new movements of enterprise. The greatly increased production of ferro-manganese and the recovery of benzol and other by-products of coke manufacture are notable examples.

One of the most striking and perhaps important developments that has run contemporaneously with the war has been the rapid expansion of the electric steel-making industry in this country. The past 18 or 19 months have seen the number of furnaces in operation or building grow from about 25 to about 70 at the present time. The largest part of this increase has come during the past six months.

Various factors incident to the war have contributed to this impressive enlargement of capacity, including the shutting off of imports of alloy and special carbon steels, principally from Germany, the handicapping of the crucible steel industry by the sharply advanced cost and shortage of crucibles because German clays no longer are available, which has led to the adoption of electric steel where crucible steel formerly had been used; and the manufacture of munitions. Added to these have been the natural evolution of the adoption in this country of the electric furnace as a method of high-quality production, following several years of experimental use and demonstration in large steel plants and foundries, and a period of tested development in Europe. It is an important fact that only a comparatively few of the new plants have a direct war character or are intended for the manufacture of munitions. By far the most of them will produce for general commercial requirements, special steel for castings, tool and other high-grade manufacturing steel, which, in large part, was imported before the war. The moderate-sized furnace accordingly has been the most popular unit, the average capacity being about six tons.

The electric steel industry, like all radical departures in manufacturing practice, has important problems to surmount before its future can be regarded as completely assured. One of these is the human element, because a high and specialized skill in the operation of the furnace is essential to the best results. A new school of steel experts must and will be developed in time. The numerous plants already installed or building and the many others that are in contemplation at present, however, show that electric steel-making in the United States has reached a scale of settled utility and of diversified application, that bespeaks its permanent character. The best feature of it all for the country is that it is building up a new industry founded upon demands which formerly had been served, directly or indirectly, from abroad.

Fitting Men for Foreign Fields

WHEN THE doors of world-wide trade unexpectedly were thrown open to America by the outbreak of the European war, many manufacturers, confronted by new conditions, found it extremely difficult to extend their field of operations, simply because they had no representatives in their employ who understood the language, banking methods or requirements of the foreigners who turned to us for products formerly furnished by belligerent nations. During the last 18 months, export departments have been established by a number of steel producers and many concerns have established connections with exporting companies to represent them in foreign countries. Hundreds of young men are being trained for work in foreign fields.

The National City Bank of New York, which has been a prominent factor in the development of South American trade, has hit upon what seems to be an exceedingly satisfactory solution of the export situation, by the establishment of an educational department, the function of which was described at the recent foreign trade conference at New Orleans. After opening several branch institutions in South America, the bank found it necessary to develop men to represent it in foreign cities. As an experiment, 20 college men were employed last August and educated along lines to fit and adapt them for service in branch banks. It was planned to give each man a year's training in various departments of the institution; nine of these men, however, already have been picked out to go to South America, without completing their courses.

It has been decided to enlarge the experiment on a scale to supply all the new men in foreign fields. Arrangements have been made with a number of colleges and universities in Maine, Minnesota, California and Carolina through which three men, selected by authorities of each institution, will be chosen at the end of their sophomore year. These men will be employed by the bank during the summer at $50 a month; they will have six hours' banking practice and three hours of class room work each day. They will return to college at the opening of the fall term and

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will elect studies which will be of the most value to them in their projected employment. At the end of their third year in college, the men will resume their work and studies in the bank, returning to college again in the autumn. At the end of the first half of their senior year, members of the practical course will be permitted to leave college to enter the bank, where they will continue their studies and banking work for another year. Since work in the bank will take the place of curriculum work the second half of the senior year in college, these men will receive degrees from their alma maters in June. After completing the prescribed course, each man will be qualified to take a position in one of the branch banks. The experiment will be started next June, with from between 40 and 50 sophomores registered in the course. Aside from being trained along banking lines, the men will be educated to read, write and talk Spanish, French, Portuguese, and it is likely that other languages will be added.

If our manufacturers of iron, steel and allied products hope to retain the export business they have recently developed, after Germany, France, Russia, Italy and other belligerents are in a position to offer really keen competition, it will be necessary to develop foreign-trade bureaus or departments, along lines similar to those adopted by the National City Bank of New York.

Time for Congress to Get Busy

IT SEEMS strange that the United States, which is accustomed to doing things on a big scale, and which is supposed to be made up of individuals possessing unusual enterprise and ingenuity, should hesitate and falter in an endeavor to take advantage of the opportunity, which the war has thrust upon us, to build for ourselves an immense export trade. It is all the more strange when it is considered that the obstacles in the way of such a development are not a matter for conjecture, but are well-known, since we have only to follow along lines indicated by the experience of other nations successful in export trade, and by common sense.

Addresses by James A. Farrell, Alba B. Johnson and other speakers at the National Foreign Trade Convention in New Orleans two weeks ago, by W. S. Kies, at the convention of the National Founders' Association in New York last November, and by countless other bankers and big business men, on various occasions, indicate clearly just what is necessary. We need a merchant marine of our own instead of having to depend on the ships of other nations. We need a national policy which will encourage investments in foreign securities. We need a navy which will be capable at all times of protecting our foreign interests. We need some provision by which it will be possible to adjust our tariff to changing conditions. We need governmental sanction of a policy of co-operation among manufacturers in pushing the sales of their products in foreign fields. We need these and other things to stimulate our commercial growth abroad.

To answer all these needs, a great deal of legislation is required, and this is materializing at a snail's pace. About the only legislation, already enacted, which is designed to facilitate transactions of our merchants and manufacturers abroad is the law, recently passed, which permits American banks to establish branches abroad. One of the now available instruments for the formulation of legislation designed to benefit our export trade relations is the federal trade commission. This body is sending representatives around to manufacturers of such products as machine tools, ascertaining their ideas as to laws which are needed in order to develop our export trade. One of the main efforts of the commission appears to be to find out whether, in the opinion of manufacturers, it is advisable to permit co-operation in cultivating foreign fields. Manifestly, it will not be difficult to get positive statements on this point, since it generally is realized that it is far more desirable and economical for a number of manufacturers to sell into a foreign market through one sales organization than for each to maintain a separate organization. The commission should be urged to make recommendation sufficiently strong enough to spur congress to action.

Progress in Conservation

ONE of the signs of the times is the growing importance of the by-product coke industry. For generations coke has been made by the wasteful beehive process. The only saleable product from beehive ovens is coke, the gases and other valuable products being wasted into the atmosphere. Recently the retort process, commonly called the by-product process, has been making rapid strides. It yields gas for power or illumination, tar and all its derivatives. Benzol and toluol are distilled from the gas.

As an indication of the growth of the use of by-product coke it may be stated that every blast furnace plant in the Chicago district now is using by-product coke instead of Connellsville, with the exception of that of the Wisconsin Steel Co., subsidiary of the International Harvester Co., which owns its own coal and coke ovens in the south.

Prices Present and Past

Quotations on leading products February 23, average for January, 1916, average for November, 1915, and average for February, 1915. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Feb. 23, 1916.	Aver. for Jan., 1916.	Average for Nov., 1915.	Aver. for Feb., 1915.
Bessemer pig iron, Pittsburgh..	$21.95	$21.32	$17.45	$14.63
Basic pig iron, Pittsburgh.....	18.70	19.20	16.70	13.45
No. 2 Fdy. pig iron, Pittsburgh	19.45	19.95	16.45	13.95
Northern No. 2 Fdy., Chgo....	18.50	18.50	17.12	13.00
Lake Superior Charcoal, Chgo..	19.75	19.25	17.50	15.75
Mall., Bess., Chgo.....	19.00	19.00	17.12	13.00
Southern No. 2, Birmingham...	15.00	14.13	11.75	9.50
Southern Ohio No. 2, Ironton..	18.00	17.00	14.88	12.75
Basic, eastern Pa.....	19.50	19.50	17.75	13.75
No. 2X Virginia furnace.....	18.00	17.50	15.50	12.50
No. 2X foundry, Philadelphia...	20.00	19.75	17.50	14.25
Ferro mang., Balti., (forward)..	150.00	125.00	100.00	100.00
Bessemer billets, Pbgh.....	35.00	33.75	27.75	19.50
Bess. sheet bars, Pbgh.....	35.00	33.75	28.25	20.00
Op.-h'th sh. bars, Pbgh.....	35.00	34.75	28.50	20.00
Open-hearth billets, Pbgh.....	35.00	34.75	28.00	19.50
Steel bars, Chgo.....	2.54	2.03	1.79	1.31
Steel bars, Pittsburgh.....	2.25	1.865	1.625	1.10
Iron bars, Philadelphia.....	2.259	2.259	1.759	1.15
Iron bars, Cleveland, local del'y.	2.40	2.00	1.50	1.15

	Prices Feb. 23, 1916.	Aver. for Jan., 1916.	Average for Nov., 1915.	Aver. for Feb., 1915.
Iron bars, Chgo. mill.....	$1.95	$1.83	$1.48	$1.04
Beams, Chgo.	2.54	2.03	1.79	1.31
Beams, Pittsburgh	2.25	1.865	1.625	1.10
Beams, Philadelphia	2.409	2.159	1.959	1.25
Tank plates, Pittsburgh.....	2.35	1.875	1.625	1.10
Tank plates, Chicago.....	2.64	2.05	1.79	1.27
Tank plates, Philadelphia.....	2.759	2.409	1.959	1.25
Sheets, blk., No. 28, Pbgh.....	2.60	2.58	2.22	1.80
Sheets, blue an., No. 10, Pbgh.	2.60	2.45	1.80	1.30
Sh., galv., No. 28, Pbgh.....	4.75	4.75	3.90	3.01
Wire nails, Pittsburgh.....	2.30	2.125	1.87	1.55
Connellsville fur. coke, contr...	2.50	2.38	2.35	1.65
Connellsville fdy. coke, contr...	3.50	3.00	2.96	2.25
Heavy melting steel, Pbgh.....	17.00	17.50	15.31	11.62
Heavy melting steel, east'n Pa..	16.50	17.00	14.50	10.50
Heavy melting steel, Chgo.....	15.00	15.50	13.13	9.44
No. 1 wrought eastern Pa.....	22.50	22.50	17.00	12.00
No. 1 wrought, Chgo.....	14.75	15.50	12.75	8.88
Rerolling rails, Chgo.....	17.00	17.68	14.31	9.62
Car wheels, Chgo.....	13.75	14.75	12.73	10.00

(For Additional Prices See Page 462.)

Heavy Sales of Bessemer and Basic

Market Wakes Up in Central West—Youngstown Sheet & Tube Buys 20,000 Tons and Portsmouth Steel Co. 30,000 Tons—Considerable Subsurface Activity in the East

Pittsburgh, Feb. 22. — After a prolonged period of inactivity, during which prices remained almost stationary, the pig iron market in the central western district showed signs of renewed activity last week, when the Youngstown Sheet & Tube Co. closed for about 20,000 tons of standard bessemer iron and 5,000 tons of gray forge, for shipment before July 1. The bessemer iron was obtained at $20, valley, or 50 cents below what had been regarded as the market price; the gray forge iron also was purchased at slightly below the general market, at $17.50, valley.

The Portsmouth Steel Co. has closed for from 30,000 to 40,000 tons of southern Ohio basic iron at what is reported to be $18, furnace, and the American Rolling Mill Co., Middletown, O., is understood to have taken about 25,000 tons of standard basic for shipment the last half of the year from furnaces at Columbus and Toledo. It is likely that more important consumers of pig iron will figure further in the market before the end of the month. While a number of blast furnace interests have been able to accumulate some surplus tonnage, yet it is believed that an actual shortage of pig iron will develop before July 1. Moderately heavy tonnages of No. 2 foundry and malleable grades are being sold at a spread from $18.50 to $19, valley, for shipment the second, third and fourth quarters of the year.

Philadelphia Undercurrent Strong

Philadelphia, Feb. 21.—Considerably more new business in pig iron in this district is moving than is apparent on the surface, and a better tone continues, but general buying still is lacking. One large selling house here reports its bookings of foundry iron since Feb. 1 have averaged well over 1,000 tons daily. One lot of 5,000 tons is included. A local ship builder has purchased 2,000 to 3,000 tons of Nos. 2 plain and 3, for delivery to start next month. A quiet negotiation for 1,000 tons of foundry is under way and several for 500 to 1,000 tons. A Phillipsburg, N. J., pipemaker closed for 8,000 to 10,000 tons of No. 2 plain for last half, principally last quarter. Prices seem steadier than a week ago and northern No. 2X ranges from $20 to $20.75, Philadelphia. A Virginia maker, who has been holding its make off the market, now is selling some iron at $18.25, furnace, for No. 2X, or 25 cents over the Virginia Iron, Coal & Coke Co. schedule. In steelmaking grades it now is a settled fact that a Buffalo furnace will furnish 10,000 tons of the recent Lukens Iron & Steel Co. basic order. This iron will be low in phosphorus and the price was considerably over $19.50, delivered. Further inquiry for this grade of basic is current in this district. A Trenton, N. J., steelmaker is asking 5,000 tons of basic for third and fourth quarter. Basic is quoted at $19.50 to $20, delivered. Considerable inquiry for last half low phosphorus iron continues and one sale of 1,000 tons of standard metal was made at $30, furnace. Canadian shellmakers are inquiring freely for this grade, but cannot be satisfied because of the heavy domestic demand. There are reports of lower prices being made on Lebanon low phosphorus. A Trenton, N. J., buyer is out for 500 to 1,000 tons of last half malleable.

New York Market Strong

New York, Feb. 22.—Quiet buying by large users has been the most noteworthy recent development of the pig iron market. The significance of this yet remains to be shown, since the general market displays on its surface no extensive change in the limited activity which recently has ruled. According to leading sellers, the volume

(*For complete prices see page* 462.)

of new business steadily being taken from larger buyers without general inquiry, makes a very comfortable total. One or the largest users in New Jersey has placed about 10,000 tons of foundry iron for shipment up to July. A New Jersey pipemaker bought 7,000 to 9,000 tons of 2 plain for delivery after July 1 at about $19.50, delivered, and has been negotiating for some additional tonnage. The Eastern Malleable Iron Co., or Malleable Syndicate, is inquiring for 5,000 tons of malleable for last half. It has bought little iron for some time, and if prices are satisfactory it may close for a large tonnage. A buyer in the Newark, N. J., district, took 1,000 tons of No. 2 plain for last half at an average price of about $20, delivered. A Newark pipemaker closed for 1,000 tons of low-grade iron. Prices are firmer. Some of the large transactions recently put through in this district have been on the basis of $20.25 to $20.50, tidewater, for No. 2X. Ror No. 1, $20.75, delivered, has been paid. The minimum price of Buffalo iron more squarely seems to be $18.50, furnace, for No. 2X, or about $20.35 to $20.60, tidewater. Some eastern Pennsylvania makers again are disposed to hold for $20, furnace, following a recent drop from that level. Export inquiries remain numerous but few of them result in sales, owing to the shortage of vessel room. A New York middleman this week asked for 6,500 tons of iron for shell purposes, analyzing 2.60 to 3 per cent silicon, 1.30 to 1.40 manganese and 0.05 both phosphorus and sulphur; as well as for an indefinite tonnage of malleable in 500-ton lots.

Sales Jump Up to 30,000 Tons

Buffalo, Feb. 22.—Sales for the week in the Buffalo district amounted to 25,000 to 30,000 tons of all grades. The market is fairly active and most of the orders represent small tonnages, although a few orders of size were taken. Furnace interests do not consider that the activity at this time amounts to general buying. Prices remain very firm on the basis of previous quotations. The only apparent tendency of prices, however, is upward rather than toward a softening. It is believed a further advance may appear at any time. This situation is due to the fact that the melters obtaining pig iron from the Buffalo furnaces are becoming more active.

Many of the consumers that had been below par in production are now finding that their stocks of pig iron are insufficient to meet the increased consumption. Their new needs in the aggregate will cause, it is believed, a sufficient demand to bring about a further advance in prices, because of the sold-up condition of the furnaces.

Buys Large Tonnage

Youngstown, Feb. 22.—Purchases of pig iron by the Youngstown Sheet & Tube Co. during the past two weeks have aggregated 30,000 tons. Of this, 25,000 tons were bessemer iron and 5,000 tons gray forge. The bessemer grade was secured a few days ago at $20, valley, for delivery beginning immediately and extending to July 1. This grade had been established at $20.50 to $21, and it is believed that the new minimum will disappear shortly. The gray forge iron was taken at $17.50, valley. The demand for merchant grades continues active.

Chicago Market Awakens

Chicago, Feb. 22.—Chicago melters are awakening to their needs for last half and malleable iron is especially active. Sales of 1,000 to 1,500 tons have been made at the price of $19, furnace, which is firm and unyielding. Large inquiry is current and a buying movement is on the way, from all indications. Melters apparently are feeling out the market and taking only part of their requirements, in the hope some change to their advantage later may take place.

Foundry users are also more active than for some time past, but are not so interested as malleable buyers. Steady buying of small tonnages for immediate delivery continues as melters find their former buying insufficient for their needs. No. 2 foundry holds firmly at $18.50, furnace.

Inquiry now current is estimated at 25,000 tons to 50,000 tons and much of this seems likely to be closed in a short time. No stocks are being accumulated on furnace yards and only occasional casts of high silicon are held from immediate shipment. These, however, do not remain long in storage as high silicon irons are commanding high prices and are taken readily.

Southern iron appears to have firmed to a minimum of $15, Birmingham, lower prices not being met in competition as formerly. Some makers are asking $15.50, Birmingham, for first delivery. Last half delivery is being contracted at $15.50 to $16, Birmingham.

St. Louis Concern Buys Basic

Cincinnati, Feb. 22.—The Portsmouth Steel Co., Portsmouth, O., has closed for about 35,000 tons of basic iron, and the Scullin-Gallager Iron & Steel Co. has purchased 15,000 tons of the same grade. The Kokomo Steel & Wire Co., Kokomo, Ind., is inquiring for 35,000 tons of basic iron, which will be bought before the end of the week. Among other inquiries pending is one for 2,500 tons of northern foundry iron from a southern Ohio melter; also central Ohio users are out for 1,000 tons of basic iron, 1,000 tons of malleable iron, which will go to Springfield, O., 1,000 tons of northern foundry iron, and 500 tons of southern foundry iron. Recent sales include 6,000 tons of northern foundry iron, 500 tons of silvery iron in Michigan, together with 2,000 tons of northern foundry iron and 1,000 tons of southern foundry iron in central Ohio. The minimum price of southern No. 2 foundry iron has been advanced to $15, Birmingham basis, for the first half, and to $15.50 for second half. Southern Ohio No. 2 foundry is quoted at $18, Ironton basis, for the entire year, and silvery iron is given at $25, furnace, for 8 per cent silicon.

(For complete prices see page 462.)

St. Louis Market Active

St. Louis, Feb. 22.—The pig iron situation shows marked improvement in the St. Louis district, both in point of recent sales and inquiries before the market today. The latter include 3,000 tons of malleable and 300 tons of Bessemer ferro-silicon, and quite a number of scattering inquiries for small tonnages. Sales during the past week were 15,000 tons of basic, 2,000 tons of malleable and 1,000 tons of northern basic. These sales were closed toward the middle of the week after some lively bidding on the part of sales agents. Southern No. 2 is firm at $15 to $15.50 for any delivery except last half. Northern iron is held at $18.50 to $19, Chicago, and $18 to $18.50, Ironton.

Warrant Iron a Boomerang

Birmingham, Ala., Feb. 21.—There is no denying the fact that all producing interests are at last coming to realize that $15 to $15.50 for first and second half deliveries of No. 2 foundry are the prevailing prices. One large interest, in its endeavor to hold firmly at $15.50 for first half and $16 for last half, has lost the sale of considerable iron; and this concern will now consider offers of $15 and $15.50. Those concerns which have sold warrant iron are also coming fact to face in competition with their own product at 50c to $1 a ton under their own selling price. This is the history of warrant iron, especially on such a market as exists today; there is too much profit in the iron not to turn it loose when things appear the least

soft. One interest reports the sale of 1,500 tons during the week at the prevailing market price; another company sold 2,500 tons of standard iron at $15.50 per ton for last half delivery and 2,000 tons of special analysis iron for last half delivery on basis of $17.50 per ton for 2.50 per cent silicon. Another interest sold 3,000 tons for last half at $15.50 per ton. The Woodward Iron Co. has announced that it will put one of its large stacks on basic iron for the last half. This will mean something like 10,000 to 12,000 tons per month less of foundry iron for this market. With the present outlook, it is hardly probable that any additional stacks will be blown in on foundry iron.

More Buying

Cleveland, Feb. 23.—A fair-sized buying movement in pig iron has developed during the past few days, breaking up the dullness prevalent in this district for several weeks. A number of orders were closed and inquiries are in heavy volume. With southern Ohio makers about sold up for last half, local sellers expect additional firmness in this market. Considerable buying has been in progress in southern Ohio, with the American Rolling Mill Co. furnishing the largest inquiry. It is also believed that some companies which have been increasing their steel making capacity, will endeavor to cover their pig iron requirements shortly. One lot of 400 tons of Alabama iron was sold into this district at $16, Birmingham, while a larger lot was later purchased from another seller at $15. The new blast furnace at Canton will be completed earlier than expected. No. 2 foundry is held at $19, Cleveland delivery.

Tin Plate Now $4

Pittsburgh, Feb. 22. — The American Sheet & Tin Plate Co. has adopted the $4 base price of tin plate. This figure, however, is regarded as nominal, since none of the larger manufacturers is in a position to assume additional obligations for shipment during the 1916 season. Demand for this material for export is tremendous, but makers are unable to entertain many of the foreign inquiries, because of the impossibility of moving tonnages to the seaboard. The inquiry for 45,000 boxes a month for export is still pending.

As a result of a demand by the employes in the foundry department of the American Sawmill Machinery Co. for a 10 per cent increase in wages, the company on Feb. 16 decided to give the advance asked. As a result of the increase, the molders now are paid on the average of 35 to 40 cents per hour.

Cities Are Buying

Cast Iron Pipe Although High Prices Bar Out Some Buyers

Chicago, Feb. 22.—Cities are inquiring for cast iron pipe for this year's extensions, this being the normal period for such buying. However, it appears that present high prices are restricting purchases and extensions which can be delayed are not being figured for this year's work. This promises to make a considerable difference in the year's output and buying is being kept down to absolute necessities.

Figures were taken at Evansville, Ind., Feb. 21 on 500 tons; at Mason City, Ia., the same day, on 600 tons, at Cincinnati, Feb. 23, on 4,650 tons. Bids will be opened at St. Louis Feb. 25 on 7,200 tons of 36-inch pipe; at Detroit, Feb. 29, on 5,500 tons; and at Columbus, O., Feb. 29, on 1,800 tons.

New York Bidders Eager

New York, Feb. 22.—Prices of cast iron pipe, where sharp competition has frequently been the rule in the past, continue very steady. On a recent letting in New York state, involving $15,000, the difference between the low bidder and his nearest competitor was less than $50. The price schedule which eastern makers generally are holding, continues at $32.50, New York, for 4's alone, or $29.50, New York, for 6 and 8's alone, the freight being about $1.50. Where these sizes are included with other diameters, the usual quotations are $37, New York, for 3's; $32, New York for 4's, $29, New York, for 6 to 20's and $28.50, New York, for 24's and larger. These prices apply to class *B* pipe, class *A* being $1 higher. Bids are expected to be asked about April 1 on 5,000 tons of 4 to 16's for aqueduct construction in Havana. The United States Cast Iron Pipe & Foundry Co. has received 480 tons for Lewiston, N. Y., at $28.40, delivered, for 6 and 10's and $31.40, delivered, for 4's.

Pipe Founders Are Busy

Birmingham, Ala., Feb. 21.—A visit to the cast iron pipe plants during the past week revealed very busy conditions with some plants running full time and some night and day. There has been quite a heavy buying movement, comparatively speaking, going on in a quiet way in different cities, due probably to the fact that the municipalities fear a heavy advance for the near future. Present prices are being maintained and substantial business is being booked. Following prices are quoted per net ton f. o. b. cars for standard pipe, 4-inch to 6-inch, $28; 6-inch and over, $25, with $1 per ton extra for gas pipe and 16-foot length pipe.

(*For complete prices see page* 462.)

Rapid Fire Advances

Characterize Nut, Bolt and Rivet Market —Differential Now $15 *a Ton*

Pittsburgh, Feb. 22.—Rapid-fire price advances have featured the nut, bolt and rivet market the last few days. Nuts and bolts last Friday were advanced 10 per cent; on Saturday, rivets were put up $2 a ton and another $2 advance was announced by rivet makers yesterday, placing structural rivets at 3c and boiler rivets at 3.10c for shipment before July 1. The differential between rivet and steel bar prices now is $15 a ton, as against a $7 margin which existed a year ago. Twelve months ago, however, manufacturers quietly were selling rivets at several dollars a ton below the published market price.

Draft New Schedule

New York, Feb. 22.—Eastern makers of nuts and bolts have put into effect a new schedule of prices representing an average advance of approximately 10 per cent. The new schedule, which became effective Feb. 16 is as follows:

Bolts and Nuts.

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled threads, 65 and 5, cut threads 65; larger or longer, 50 and 15.

Machine bolts with hot pressed nuts, ⅜ x 4 inches smaller or shorter, rolled 65 and 10; cut, 65 and 5; larger or longer, 50 and 20.

Cold pressed, semi-finished hex. nuts, 75 and 10.

Gimlet and cone point lag bolts, 65, 10 and 5. Hot pressed square, blank or tapped nuts, $3.70 off list; hot pressed hexagon blank or tapped, $3.80.

Cold pressed square, blank or tapped, $3.50 off; hexagon, blank or tapped, all sizes, $4.25.

Rivets.

Structural rivets, Pbgh	2.80c
Structural rivets, Chgo. delivery	2.90c
Boiler rivets, Pbgh	2.90c
Boiler rivets, Chgo. delivery	3.00c

Nut Prices Up

Chicago, Feb. 21.—An advance on nuts has been announced by several manufacturers. On hot pressed nuts the new discount is $3.70 off list for square and $3.80 off list for hexagon. On cold punched C, T and R nuts the discount is $3.50 off list for square and $4.25 for hexagon.

The C. F. Sammond Co., 84 Detroit street, Milwaukee, will represent the Hill & Griffith Co., Cincinnati, manufacturer of foundry facings and equipment and polishing and plating supplies in Milwaukee and immediate vicinity.

Buyers Are Not Particular

Many Consumers Are Glad to Get Discards—Cast Off Blooms Bring $38 Mill—Shortage in West

Philadelphia, Feb. 21.—The unsual stringency in the supply of semi-finished steel is shown by the way consumers are taking in irregular or rejected material, which in ordinary times could not be marketed. A rather amusing illustration is offered in this district. Several years ago a certain buyer rejected a consignment of blooms, and the seller, being unable to dispose of them elsewhere, had permitted them to lay practically forgotten in the former's yard. Recently the shortage of semi-finished steel caused the seller to recall the incident. The upshot of the matter was that the original buyer was glad to re-buy the material at a considerably higher price than he first had paid. Several hundred tons of old, cast-off blooms from the mill yard have been sold in this territory by an Ohio producer at $38, mill, or about $41, delivered. An eastern maker this week sold some irregular slabs at a high price. Chicago mills are reported to have offered rolling billets in the east at $43, delivered, or about $38, at the maker's plant. Several ammunition makers are asking for forging blooms and billets for last half and there are inquiries from the regular trade for billets for third quarter, but eastern makers are not quoting. The nominal eastern prices remain from $42 to $45, mill, for ordinary open hearth rolling and $55 to $60, mill, for forging.

Semi-Finished Steel Higher

Pittsburgh, Feb. 22.—Small tonnages of bessemer billets have been sold at $38, Pittsburgh, or $3 a ton above the previously prevailing maximum price. Open hearth billets have commanded $40 a ton and above at Pittsburgh. The market for sheet bars has not been tested recently, owing to the fact that most consumers covered requirements several months ago. A number of steel foundries, affected by the molders' strike, are offering ingots in the open market, but no market prices have been established definitely. Wire rods nominally are listed at $50 a ton; leading manufacturers are unable to offer this material for second or third quarter delivery. Some well informed authorities say $60, Pittsburgh, could not be shaded.

All Grades Higher

Youngstown, Feb. 22.—Some sheet mills which are not fully covered for second quarter and last half requirements of sheet bars are experiencing difficulty in securing the tonnages desired. One sheet maker refused to cover at $40, the best quotation received on his inquiry. Most mills are protected by long-term contracts but they are unable to secure the maximum tonnages specified. The sheet mills are receiving from 60 to 65 per cent of their specifications and the necessity for covering this deficiency has brought some mills into the market already. Handsome premiums are being paid for early delivery, one sale of 3,000 tons of open hearth billets being made at $43 the past week for prompt delivery. The previous minimum of $34 on bessemer billets and sheet bars and $35 on open hearth grades seems to have disappeared entirely and the market for prompt shipment is quoted at $33 to $40.

Spiegel is Rising Fast

Shortage of Ferro-Manganese Boosts Price of Silvery Product to $50 Furnace for Last Half—Cargo of Ferro Arrives

Philadelphia, Feb. 21.—Heavy sales of domestic spiegeleisen having been made for last half at $45, furnace, a price which went into effect Feb. 18. Makers today advanced $5 further to $50, furnace. Some tonnage has been sold at the new figure. The market has heard the past few days that the Pueblo, Colo., maker is arranging to offer a certain tonnage of 30 to 35 per cent spiegeleisen at $75, furnace, but this matter seems to have been deferred for the present. The metal is to be made from domestic ore.

The steamer PARISIANA has arrived at Baltimore from England with 2,000 to 3,000 tons of ferro-manganese. This may tend to relieve, for the time being, the extreme scarcity and high prices for spot material.

Strong Demand for Ferro

New York, Feb. 22.—Continuing acuteness in the supply of ferro-manganese and spiegeleisen is keeping up the extraordinary advance in these alloys, and is also responsible for several new plans for increasing the domestic production. Several furnaces in eastern and western districts may be leased for this purpose. Domestic spiegeleisen has been increased to $45, furnace, for 20 per cent for last half shipment. The $150, seaboard, price on English ferro-manganese on last half contracts has become practically nominal, the producers apparently having sold all the metal they desired to dispose of at that figure. Another advance of the contract market in the near future is now expected. Spot and early delivery ferro-manganese continues to command very high prices. For spot, $225 to $250, domestic furnace, or seaboard, is considered the market. One resale of English metal for delivery in April was made by a merchant this week at well over $180, seaboard. Early ferro-manganese remains exceedingly severe. Important interests, including some of the largest users in the country, appear willing and glad to pay the present high prices for last half contracts and are exerting efforts to get the makers to obligate themselves on a tonnage for that period. One of these, in the middle west, is asking 1,500 to 2,000 tons for last half and probably would take a larger amount if sellers were willing. Part of the production of ferro-manganese to be made at the North Cornwall, Pa., furnace of the Lackawanna Iron & Steel Co. will be marketed and the balance will go to the needs of the Lackawanna Steel Co. The furnace is to be operated on a conversion arrangement with Philadelphia interests, the latter to furnish Brazilian manganese ore.

Ferro Situation Causes Alarm

Pittsburgh, Feb. 22.—The uncertainty of the future market for ferro-manganese is causing no little worry on the part of prominent steel producers throughout the country. Buyers and sellers alike are at a loss to know how much material will be available the second half of this year and every possible economy is being practiced to conserve present stocks. Rather heavy inquiry for this alloy for shipment the third and fourth quarters has come out, but scarcely any tonnage has been sold in the open market for extended shipment. Spiegeleisen, which can be used as a substitute to a certain extent, has advanced $10 a ton this week to $50, furnace, for future shipment. It is not unlikely that further advances in price will be made

(*For complete prices see page* 462.)

shortly. Demand for 50 per cent and lower grades of ferro-silicon is decidedly heavy; prices of the former alloy are nominal. All grades of steelmaking metals are scarce and it is extremely difficult to define the position of the market for such metals as vanadium, tungsten, ferro-chrome, ferro-molybdenum and the like.

Manganese Ore Prices Higher

Philadelphia, Feb. 21. — Foreign manganese ore prices continue on a phenomenal level. Indian ore now is quoted at about 70 cents per unit of manganese at tidewater, which for a 60 per cent ore means $42 a ton. High ocean freights continue to lift the seaboard figure. Several inquiries are in the market for cargo lots of Brazilian ore, but the quantity of that ore available in the open market is very small. Middlemen have been unable to get a quotation on these inquiries from the miners. A moderate tonnage of Canadian low phosphorus iron ore is being offered in the eastern market.

Want Bigger Shell Rounds

Mills Appear Reluctant to Supply Larger Than 3-Inch Sizes—New Mill to Open

New York, Feb. 22.—Munition makers in this country and abroad now are turning more attention to the production of large-sized shells, notably 12-inch, with a consequent heavy inquiry for large-sized rounds. French works still are negotiating for an important tonnage of large rounds for high explosive shells to supplement their recent orders for several hundred thousand tons of shrapnel sizes for last half. The mills do not seem anxious for orders for round sizes above approximately 3-inch and negotiations have been dragging. It is reported that a New York state mill which is about to resume operations, has been negotiating with representatives of foreign powers here for the sale of 50,000 to 100,000 tons of shell material.

Bars Command Premiums

Philadelphia, Feb. 21.—Steel bars for specific delivery continue to command attractive premiums for the seller. One lot for shipment in three weeks was placed here the past week at about 2.35c, Pittsburgh. Regular consumers, including some of the eastern Pennsylvania implement manufacturers, continue to make inquiry for contracts, but makers, as a rule, despite the $5 per ton advance of the week to 2.25c, Pittsburgh, are not selling on the quarter to quarter basis. There are plenty of inquiries in the market for large rounds and other shell steel both for first and second half shipment, but eastern makers remain rather indifferent toward this business except at their own prices since they are finding their unsold tonnage from July to January will be limited. The demand continues to incline towards steel for large-sized shells, and one maker with ammunition plants in the east now is understood to be producing 10 and 12-inch rounds for this purpose. Some foreign contracts for 12-inch shells now are held by manufacturers in this country. The Baldwin Locomotive Works has been awarded 10,000 3-inch common steel casings for the Frankford arsenal of the United States government at $1.75 each, and bids have been taken on 3,000 3.8-inch and 3,000 4.7-inch shrapnel case forgings.

Bars Climb Upward

Pittsburgh, Feb. 22. — The Carnegie Steel Co. on Feb. 18, put up its price of steel bars $5 a ton to 2.25c for delivery at the convenience of the mill. Independent manufacturers have adopted that figure, the highest to prevail in the history of some of the larger steel companies.

It develops that some of the central western argicultural implement makers, about a month ago, obtained some tonnage for shipment the last half of the year, at 1.90c, the market price at that time. In the neighborhood of approximately 400,000 tons of steel bars are required annually by agricultural implement manufacturers; not more than 50,000 tons have been sold for shipment this year. Maunfacturers in this district have declined to accept tonnages for delivery after Jan. 1. Generally, makers of agricultural machinery have been able to buy for 12 months delivery.

Entente nations continue to negotiate for tremendous tonnages of steel bars for the manufacture of shrapnel. Mills are refusing to sell for delivery after Jan. 1.

Advance is Academic

Chicago, Feb. 22.—An advance of $5 per ton on steel bars by the leading interest last week has been followed in practically every instance by independents. Inasmuch as most independents are not in the market, the advance is purely academic and really does not affect the situation. Most mills are unwilling to make contracts running beyond the present years delivery and thus are entirely out of the market as far as new business is concerned. The increase brings soft steel bars to a basis of 2.44c, Chicago, but in the rare instances where prompt delivery materials can be obtained, premiums of several dollars per ton must be paid.

Hard steel bars continue at 2c, Chicago mill, but an advance of at least $2 per ton probably will be announced shortly to bring this product more nearly in line with soft steel.

Bar Iron Strong

Chicago, Feb. 21.—Makers of bar iron find conditions strengthening, and while some tonnage is being taken at 1.95c, Chicago mill, the market appears to be represented at 2c, Chicago mill. One important producer has retired from the market and will not take on further tonnage at any price while others, not so strongly situated, are willing to contract for immediate delivery. Contracts for iron bars, with few exceptions, run less than 60 days, and the mills are in an excellent position to realize on spot business when it is offered.

Offer Western Bars

Philadelphia, Feb. 21. — Present prices of 2.25c, Pittsburgh, or 2.409c, Philadelphia, quoted by eastern makers of bar iron, have opened the possibility of invasion of outside material into this territory. A price of 2c, Chicago mill, now quoted there, means 2.30c, this territory. Representatives of Chicago mills offered here this week a limited tonnage before July on this basis, but before it could be closed, the lot was absorbed in the west.

Hoops, Bands, Shafting and Strip Steel.

Pittsburgh, Feb. 22. — The Carnegie Steel Co. last Friday advanced hoops and bands $5 a ton to 2.50c and 2.25c, respectively. Despite the sharp advance, demand continues heavy.

Shafting is being held at 40 per cent off the list for carload tonnages, and from 30 to 35 per cent off the list is being quoted for less than carload lots. Warehouses have advanced shafting to the list price and some warehouse material has been sold at 10 per cent above the list price.

Strip steel now is being quoted at 4.50c for shipment the remainder of the first half of the year, or $5 a ton above the previously prevailing price.

(For complete prices see page 462.)

Shape Buyers Pile Stock

Fabricators Taking Full Contract Commitments as Insurance Against Higher Prices—Big Bridge Tonnage Placed

Philadelphia, Feb. 21.—Prices of structural shapes have been raised by eastern Pennsylvania makers to a minimum of 2.25c, Pittsburgh, or 2.409c, Philadelphia. Small lots for urgent delivery are quoted $5 higher or 2.50c, Pittsburgh, or mill, depending whether the delivery point is east or west. Despite the manifest holding up by the high steel prices of much building work except that of a war character, the eastern mills continue to receive heavy specifications and deliveries on any large tonnages remain a matter of months. It is apparent that some of the fabricators are drawfully against their contracts for plain material though their shops are not completely engaged and are storing up stocks as a protection against higher prices or shortages later. Small fabricated jobs still predominate. The Pennsylvania Steel Co. has virtually closed for another section, 9,000 tons, for the Pennsylvania railroad bridge across the Ohio river at Louisville.

Many Small Items

New York, Feb. 22.—In point of numbers, the orders and inquiries for fabricated steel material now coming out in this territory make a remarkable showing, but the total is not considerable. Large fabricators report hundreds of these small items within a single week. The railroads are following this ruling in placing orders for bridges. A large number is being inquired for or placed, but none is of considerable size, except that of the New Haven railroad for a structure across the Thames river at New London, Conn., previously referred to. The substructure now in the market will require 5,000 to 6,000 tons and the superstructure, to come later, calls for possibly 3,000 to 4,000 tons. Eastern shape makers have quickly adopted the new price of 2.25c, Pittsburgh, or 2.419c, New York, for plain material, resulting from an advance of $5 announced by the Steel Corporation subsidiaries Feb. 18. Shapes from warehouse now are quoted at 2.95c, New York delivery.

Shapes Sharply Advanced

Pittsburgh, Feb. 22. — The Carnegie Steel Co. last Friday put up structural shapes $5 a ton to 2.25c, at which price material is being offered for shipment at the convenience of the mill. Specifications for structural material are coming out in heavy volume and most mills are sold up for the remainder of this year. What has been said about the market for steel plates and bars, is applicable to the situation for shapes. Demand for reinforced bars is heavy; most mills are unable to accept specifications for delivery the first half.

Shape Tonnages Better

Chicago, Feb. 22.—Although a sharp advance of $5 per ton on steel shapes was made last week by the leading interest and is being followed by independents, tonnages closed during the past week are somewhat larger than has been the case recently. Projects booked recently are for a wide variety of purposes and are well scattered over the western country.

CONTRACTS PLACED.

Bridge work for the Huntington & Broad Top railroad, 250 tons, to the American Bridge Co.

Bridge work for the Erie railroad, 300 tons, American Bridge Co.

Bridge work for the Baltimore & Ohio railroad, 250 tons, divided between the King Bridge Co. and the Fort Pitt Bridge Works.

Fourth avenue subway section in Brooklyn, 300 tons, to the American Bridge Co.

Wickwire Steel Co., Buffalo, steel mill addition, 250 tons corrugated roofing, siding, etc., to American Rolling Mill Co.

Wickwire Steel Co., Buffalo, steel mill addition, 3,200 tons to Lackawanna Bridge Co., Buffalo.

West-End Traction Co., Cincinnati, elevated line, 3,000 tons, to Lackawanna Bridge Co., Buffalo.

Main span of Pennsylvania Railroad bridge over the Ohio River at Louisville, 9,000 tons to Pennsylvania Steel Co. This is in addition to some tonnage previously placed with some fabricator. Draw span and other work still to be awarded.

Apartment house at Walnut and Nineteenth streets, Philadelphia, 1,200 tons to the Bethlehem Steel Co.

Schwartz department store, El Paso, Tex., 997 tons.

Woodbury County Court House, Sioux City, Ia., 823 tons to Minneapolis Steel & Machinery Co.

Sears Roebuck Co., administration building, Chicago, 743 tons, Hansell-Elcock.

Mayfair pumping station, Chicago, 700 tons, to Lakeside Bridge & Iron Works.

Garfield Smelting Co., Flue, Garfield, Utah, 452 tons, to American Bridge Co.

County of Dallas, Tex., Commerce street viaduct over Trinity river, Dallas, Tex., 435 tons, to Virginia Bridge & Iron Co.

Mitchell Realty Co., store and flat building, Mitchell, S. Dakota, 163 tons to St. Paul Structural Steel Co.

Butte & Superior Copper Co., headframe for No. 3 shaft for Black Rock Mine, Butte, Mont., 160 tons.

Capitol Elevator Co., track shed, Duluth, Minn., 132 tons to Worden-Allen Co.

CONTRACTS PENDING.

Substructure construction for apartment house for the New York Central railroad, Forty-eighth street, New York City, 700 tons, bids being taken.

Two bridges for the Baltimore & Ohio, 450 tons, bids being taken.

Three bridges for the Central Railroad of New Jersey, Allentown, Pa., 300 tons, bids being taken.

Bridge work for the Erie railroad, 850 tons, bids being taken.

Extension to Edison Electric Illuminating Co., Brooklyn, 500 tons, bids being taken.

Baltimore Sheet & Tin Plate Co., Baltimore, 1,500 tons for new plant.

(*For complete prices see page* 462.)

Metals Quiet

Copper Producers Sold Through May—Lead Advanced to 6.30c New York.

New York, Feb. 21.—The metal markets generally have reflected considerable further strength during the week, but conditions today are rather quiet due to the approach of Washington's birthday. Most of the activity today is confined to spelter for which there are some large-tonnage inquiries. The market on prime western is quoted as follows: Spot and February 20.75c to 21c, St. Louis; March, 20.50c to 20.75c; April, 19c to 19.25c; second quarter, 18c to 18.50c; third quarter, 17c to 17.25c. Brass special is quoted at 24c, St. Louis, for prompt shipment.

The copper market now generally is sold out through May and some producers claim to be sold up through June. The market today is quiet, due largely to a decline of £1 10s in the London electrolytic quotations; this led to talk of lower prices by second sellers, but as far as known these interests did not come out with any definite offers. First hand quotations are as follows: Electrolytic for June shipment and beyond, 27.50c, delivered 30 days; best brands of lake copper for July shipment, 28.50c, cash; ordinary lake copper for July shipment 27.75c, cash; arsenical lake copper for July shipment, 27.50c, cash. On prompt and nearby shipment in small lots the first hands have been asking premiums of 1c to 2c per pound.

The lead price of the American Smelting & Refining Co. last week was advanced to 6.30c, New York, and 6.22½c, St. Louis, and the market generally is quoted at this level. Demand is quiet but the producers are well sold ahead. These interests are inclined to ask higher on export business and export sales are reported at 6.40c, New York.

The tin market has been featured by a fair volume of business but today the market is quiet. Prices are approximately as follows: Spot and February, 42.25c; March, 42c; April, 41.75c, etc.

The antimony market is quiet. Wah Chang's W. C. C. antimony is quoted as follows: Spot delivery, 44c, duty paid; March shipment from China 34c, in bond; April shipment from China 33.25c to 33.50c, in bond. Other Chinese and Japanese antimony is quoted at 43.50c to 44c, duty paid, for spot delivery. Domestic antimony for spot delivery also is quoted at the latter figure.

The outside aluminum market is exceedingly strong, due mainly to the difficulty second sellers are having in getting supplies. The demand is principally from abroad and foreign buyers offer to pay more than domestic buyers. The market on No. 1 ingot in carload lots may be quoted at 58c to 60c, with export sales reported at 61c and 62c.

Albert W. Lau has purchased the interest of his partner, W. C. Hogan, in the Lau & Hogan Co., Youngstown. The Lau company specializes in structural and ornamental iron and wire work.

Market Displays Strength

Active Demand for Heavy-Gage Sheets—Rise in Spelter Slows Up Galvanized Trade

Youngstown, O., Feb. 22.—Developments in the valley sheet market during the past few days served to intensify the trend toward firmness in the heavy gages. At the same time conditions in the light gage market are practically unchanged, while the galvanized trade is less active than it was several weeks ago. While the market at this time parallels closely the conditions that have prevailed for some months, some sellers claim to see a tendency toward strength in all grades. One seller predicted a $5 advance in all grades of sheets within four weeks, but it should be noted that for several weeks some of the makers have operated their light gage mills on part time, and in several instances have shut down entirely for seven-day periods. The insistent demand during recent months for heavy-gage sheets in large widths, as previously explained, has resulted in upsetting the usual differentials and these grades now command prices that make them attractive to the seller. However, a large part of the mill equipment was installed for rolling the lighter gages and the sag in the galvanized trade has decreased the demand for these grades. The increase in the price of spelter during the past week has caused a further decline in the demand for galvanized sheets. Mills producing galvanized grades had operated at about 25 per cent previous to spelter's recent rise. The decreased galvanized demand has a weakening tendency on light-gage black sheets. The embargoes on foreign shipments has accentuated this tendency both in galvanized sheets, of which large exports have been made recently, and also in heavier gages. Strength, however, has developed in other lines. The boom in the oil business has brought out a strong demand from steel barrel manufacturers. Some makers of strip steel are now buying sheets. These are sheared and adapted to certain uses previously confined to strip steel. A minor illustration of the efforts being made to adapt sheet products to a wider variety of uses, is the adoption of terne plate in place of tin plate for use as name plates on addressing machines. The present strength of the market rests largely on the factors outlined and their influence has been sufficient to offset any weakness that might have resulted from the freight embargoes and slackened galvanized demand. Demand for both blue and box annealed sheets continues strong. One seller 10 days ago quoted on an inquiry for 500 tons of heavy gages for export. The offer was later withdrawn. Several days ago the inquiry was repeated and the tonnage sold at $10 a ton above the price previously quoted. Most of the mills will not quote except against actual specifications. The minimum on black sheets No. 28 has been established at 2.60c, although some business was taken during the past week at 2.50c. Practically all of the low-priced sheets have now disappeared.

Want Third Quarter Contracts

Philadelphia, Feb. 21.—Buyers of sheets are inquiring of eastern makers for third quarter contracts. The latter have not made prices for that delivery, but will do so soon. It is expected that a considerable tonnage of unshipped second quarter orders will be carried over. Present prices are from 2.75c to 3c, Pittsburgh, or 2.909c to 3.159c, Philadelphia, for 10 gage blue annealed. The Pennsylvania railroad, which has been inquiring for a tonnage of heavy sheets for box car construction, has deferred this purchase temporarily.

Sheet Scarcity Pinching

Pittsburgh, Feb. 22.—Builders of automobiles have entered the market for the last half sheet requirements, attempting to buy Nos. 20 and 22 gage open hearth black sheets and long ternes for shipment during the year beginning July 1, next. Because of the uncertainty of the future market, sheet manufacturers in western Pennsylvania are hesitating about opening books for extended shipment and it is apparent that the automobile trade will not be able to obtain desired maximum tonnages. Several builders of popular cars already have fully specified against contracts, expiring July 1, next, but some of this material will not be shipped until the third quarter. Automobile manufacturers and builders of electrical equipment are offering premium prices to mills in a position to accept specifications for delivery two or three months hence.

No. 28 gage black sheets are being held at a spread from 2.60c to 2.90c in this district. Generally, open hearth steel products are commanding $2 a ton above the price of bessemer. Blue annealed sheets, deliveries of which are deferred from four to six months, likely will be advanced to a minimum of 2.90c before the end of February. Demand for galvanized products has increased moderately; No. 28 gage galvanized sheets are selling at 4.75c and above. Only 50 per cent of the galvanizing capacity of this district is engaged, owing to the high price and the irregularity of spelter. Complaint continues to be heard about the scarcity and high price of sulphuric acid, used for pickling purposes.

Sheets are Strong

Cincinnati, Feb. 22.—One mill in this territory is holding firmly at 2.80c, Pittsburgh basis, for black sheets, No. 28 gage, but others will accept business at prices ranging from 2.65c to 2.75c, Pittsburgh. These prices in most cases, apply to spot shipment only, and premiums are being asked for contract delivery because of the uncertainty of the future condition of the market. The demand is scattered, but good. Galvanized No. 28 gage are quoted at 5c, and No. 1 blue annealed at from 2.65c to 2.85c, both Pittsburgh basis.

(*For complete prices see page* 462.)

Wire Stands Still

Amid Phenomenal Advances Drawn Product Halts Momentarily

Pittsburgh, Feb. 22.—The feature of the wire market this week is the fact that there has been no further advance in price. During the last 12 months, the price of wire products has been changed 15 times. While price advances are being looked upon almost as a part of the daily routine of business, yet consumers show no hesitancy about contracting for additional tonnages. In fact the last three advances in the price of wire products have tended to stimulate demand. Domestic and foreign consumers are offering rather attractive premiums for early shipment, but larger mills in this district are refusing to entertain inquiries calling for nearby delivery.

Shafting Advances

The minimum on shafting in carload lots has been reduced to 35, and in less than carloads, to 30, mill delivery. This is an advance of five points or $5 a ton.

Thomas L. Kane, traffic manager of the Brier Hill Steel Co., Youngstown, died unexpectedly in New York City, Feb. 20. He was a member of the Pittsburgh Traffic Club and the Youngstown chamber of commerce.

Famine Exists in Plates

Mills Both East and West Are Breaking All Records and Buyers Can't Get Enough—Prices Advanced $5

Philadelphia, Feb. 21.—Eastern Pennsylvania plate makers have advanced their prices in harmony with the $5 advance announced by the Carnegie Steel Co. Feb. 18. One maker has raised his schedule over $5 a ton or to 3.25c, Pittsburgh, and 3.409c, Philadelphia, for shipment at his convenience. This producer is sold up for practically nine months. Other eastern mills have not elevated their prices so strongly and quote from a minimum of 2.75c to 3.00c, Pittsburgh, or over. The drive for tonnage upon the plate mills is unabated though production is running unusually high. The Lukens Iron & Steel Co. has been maintaining in operation 14 out of 16 open hearth furnaces. To distribute their output equitably, makers are alloting proportionate tonnages monthly to regular buyers. The Pennsylvania railroad finally has been able to place a portion of the 25,000 tons of car material it recently asked but it is canvassing the market for further tonnage. The Lenoir City, Tenn., car works has received quotations on 4,000 tons of shapes but has not been able to get prices on 6,000 to 8,000 tons of plates and will place neither. Some further boat awards have been made. The Harlan & Hollingsworth Corporation has received two more, while the Luckenbach Steamship Co. has placed a 10,000 ton freighter with the Seattle Construction & Dry Dock Co.

Plates Boosted $5 Per Ton

Pittsburgh, Feb. 22. — Finished steel products continue their spectacular march toward higher levels, and the end is not yet in sight. Last Friday, the Carnegie Steel Co. advanced plates, shapes and bars $5 a ton to 2.35c for plates and 2.25c for shapes and bars for delivery at the convenience of the mill. This is the sharpest advance announced in many years and it caused some surprise, although buying has not been affected. Most finishing mills are unable to sell additional tonnage for shipment the remainder of this year. Some tonnage for specific work has been booked for delivery in 1917.

While semi-finished steel products, pig iron and scrap have stood almost stationary since Jan. 1, all lines of finished material have been advancing phenomenally. The following advances have been made this year: Iron bars, $4; steel bars, $9; shafting, $5; cold rolled strip steel, $20; rivets, $6; nuts and bolts, 10 per cent; spikes, $8; steel chain, $17; plates, $11; shapes, $9; light steel rails, $3; blue annealed sheets, $5; steel hoops, $10; steel bands, $9; wire products, $4; tin plates, $5; iron and steel pipe, $6, and iron and steel boiler tubes, $8 a ton. Despite these sharp advances, there has been no diminution in demand.

Ship builders have been able to buy material for delivery after Jan. 1, 1917. Plates for prompt delivery are commanding 3c and 3.25c, with occasional sales at as high as 3.50c. Inquiries for approximately 10,000 steel cars are pending.

Buffalo Mills Advance Prices

Buffalo, Feb. 23.—All of the independent mills and agencies in the Buffalo district have followed the lead of the Carnegie Steel Co., and have advanced prices $5 per ton, quoting now 2.35c, base. A similar advance was made in other steel mill lines. This brings prices quoted by the mills nearer to the figures represented by the premium offers made by many consumers in desperate need of material. Deliveries are becoming more extended in plates, bars, structural and all the lines.

Buys Ship Plates

Cleveland, Feb. 23.—The ship building industry of the Great Lakes continues active. One lot of 1,500 tons of plates and shapes is understood to have been taken for an ocean vessel not previously announced.

Plates a Scarce Product

Chicago, Feb. 22.—Steel plates continue to be the most difficult finished steel product to obtain and the recent advance of $5 per ton has brought the base price to 2.54c, Chicago mill. Even at this price, buyers find it almost impossible to obtain tonnages, and instances have been known where as high as 3c, mill, has been paid for plates by consumers who needed them sufficiently to disregard the price. Warehouse stocks of plates have been drawn on severely and it is believed most stores have comparatively small tonnages and that assortments are broken.

The American Steel & Wire Co. has recorded a deed, giving it title to two plots of ground, with a total frontage of 248 feet, extending from Etna street to the Allegheny river, Pittsburgh. The property formerly was occupied by the S. Jarvis Adams Co., which was acquired by the Pittsburgh Iron & Steel Foundries Co. The site adjoins the Schoenberger plant of the American company. No announcement has been made by the purchaser.

(*For complete prices see page* 462.)

Coke Still Nervous

Traffic Situation Rules Connellsville Market—Furnaces May Bank

Pittsburgh, Feb. 22.—The Connellsville coke market offers nothing of interest this week. Spot furnace fuel continues to sell at a spread from $3.50 to $3.75, but demand is almost inconsequential. The traffic situation shows no signs of improvement; while blast furnaces have not had to be banked on account of a shortage of fuel, yet many plants have not been able to operate at maximum capacity. The market for contract furnace coke and for 72-hour coke shows no signs of excitement; prices are unchanged. *The Connellsville Courier* for the week ending Feb. 12, says production of coke in the upper and lower Connellsville regions was 441,309 tons, an increase of 8,127 tons, compared with the week previous.

Coke Prices Stiffening

Cincinnati, Feb. 22.—Prices on contract foundry coke from the Pocahontas, New River, and Wise County districts are stiffening, and may be advanced before the end of the month. Spot furnace coke is selling at a premium, and contract furnace grades are also very strong and scarce in certain districts, as furnaces are asking for shipments faster than specified in their contracts. Wise County furnace grades are given at from $2.85 to $3.10, ovens, Pocahontas furnace at from $2.75 to $3, ovens, and Wise County foundry at from $3.75 to $4, ovens.

Coke Inquiry is Better

St. Louis, Feb. 21.—The inquiry for coke is better than it has been for quite a while, with prices for 72-hour Connellsville and Virginia foundry grades stiff at $4 to $4.50 for spot delivery and at $3.75 to $4 on contract. Early delivery coke is held at a premium.

William A. Dinker, aged 66, a director of the National Fire Proofing Co., and identified with coal interests in western Pennsylvania, died at his home in Pittsburgh, Feb. 20. He organized and was secretary of the Eureka Coal Co., later absorbed by the Pittsburgh Coal Co., of which he became purchasing agent. Mr. Dinker also was secretary of the Great Lakes Coal Co.

Scrap Remains Quiet

Conditions Do Not Seem Ripe for a General Advance and Prices Are Weak in Pittsburgh

Pittsburgh, Feb. 22.—The old material market, like that for pig iron, displayed moderate weakness a few days ago, when moderately heavy buying was resumed after a prolonged period of quiet. Heavy melting steel, held at a spread from $17.50 to $18, has been obtained at $17, delivered, this week. It is not believed, however, that much stock is available at that figure. Other grades of iron and steel scrap are comparatively quiet and show no change in position.

Shipments Large; Buying Light

Philadelphia, Feb. 21.—Heavy shipments, but comparatively light buying still cover the old material situation in eastern Pennsylvania. Consumers are using scrap on a large scale, which is being met by past purchases, and they are disposed to place additional tonnages for future delivery, but sellers do not care to commit themselves. In this regard, something like a deadlock exists. A new embargo appeared this week when the railroads put the Coatesville mills under the ban. Several 1,000-ton lots of heavy melting steel have been taken by an eastern Pennsylvania steelmaker at $16.75, delivered, and smaller lots continue to be obtained at $16.50, delivered. There is a good demand for old rails, shafting, axles, etc., for re-rolling purposes, owing to the active market for reinforcing bars, light rails and other re-rolled products. Wrought pipe, borings and turnings are lower.

Lull in Scrap

New York, Feb. 22.—Cast scrap prices, which during the railroad embargoes has been selling freely at $19, delivered in Connecticut and lower New England points, now is $1 off, with the lifting of most of these restrictions and the resumption of pig iron shipments. This old material market continues quiet. The larger buyers particularly in eastern Pennsylvania, still decline to pay higher prices for tonnages and are confining themselves to small purchases. Heavy melting steel, up to 1,000-ton lots, shows continued price irregularity. Such sales during the week brought $16.75, delivered, eastern Pennsylvania.

Large Inquiries in Buffalo

Buffalo, Feb. 23.—Several inquiries are in the market for large tonnages of heavy melting steel. Demand continues good for practically all of the lines. Consumers that have been out of the market for some time are coming back with feeler-inquiries to sound the market. There has been no change in prices in the past week.

Scrap Still Weak

Chicago, Feb. 22.—Weakness in the scrap iron and steel market continues, although prices seem to have reached a more steady level and decline has been checked, at least temporarily. Some buying of heavy melting steel is believed to have been done recently, which has given more strength to the situation.

Railroad lists current this week are larger than last, although not out of line with recent offerings. The Santa Fe railroad offers 4,600 tons; Chicago, Rock Island & Pacific, 3,100 tons; the Union Pacific, 1,600 tons; the Wabash railroad, 1,300 tons; and the Belt Railway of Chicago, 1,080 tons; also the Monon, the Chicago, Milwaukee & St. Paul and the Minneapolis, St. Paul and Sault Ste. Marie railroads each 700 tons.

Scrap Situation is Uncertain

Cincinnati, Feb. 21.—The iron and steel scrap market is becoming more uncertain each day. Constant refusal of mills and foundries to come into the market for full requirements, and the gradual accumulation of old materials throughout the country, which is now ahead of demand and consumption, has caused certain sellers to make special inducements to bring about a buying movement. Prices are still sagging at the lower level, to which they declined two weeks ago. Heavy melting steel is quoted at from $13.75 to $14.25 per gross ton, No. 1 busheling at from $10.25 to $10.75 per net ton, and No. 1 machine cast at from $11.50 to $12 per net ton.

Scrap Weak in St. Louis

St. Louis, Feb. 21.—The weakness of the local scrap market is still very apparent, and although some of the industries are accepting material freely, the supply at present is so great that prices continue soft. Mills are all working to capacity, however, and the fact that stocks will soon be depleted is so obvious as to cause dealers to look for an advancing market in the immediate future. The only offerings before the market this week are: C., I. & L. Ry. Co., 820 tons; Wabash, 1,980 tons, the latter including 750 tons of cast iron car wheels.

Old Materials Slump

Birmingham, Ala., Feb. 20.—With the lack of interest in the pig iron market has come a slump in old material, and prices have slumped from 50c to 75c per ton on cast iron and steel. By reason of low grade pig iron available at reasonable figures, the Birmingham district does not consume much scrap, so dealers have to depend on Chattanooga and other outlying districts. The Chattanooga buyers, when offered scrap at old prices last week, informed sellers that their prices were out of line 50c to 75c per ton. Following prices per net ton are quoted:

Old steel axles	$13.75
Old steel rails	12.25
No. 1 steel scrap	10.25
No. 1 wrought scrap	9.75
No. 1 cast scrap	10.50
Heavy cast scrap	10.25
Stove and light cast	8.50
Old car wheels	10.50
Tram car wheels	10.00

(*For complete prices see page* 462.)

Warehouse Prices Go Up Again

New York, Feb. 22.—In line with the advance in finished steel products, warehouse prices in this vicinity have been raised $5 a ton more. This places plates at 3.50c and shapes and bars at 2.95c, for New York delivery. The store demand remains very heavy.

Another Philadelphia Advance

Philadelphia, Feb. 21.—In line with the advance on mill material, a higher schedule has been adopted by the warehouses in this district. Shapes and steel bars now are held at 2.85c at the warehouse and plates at 3c. Demand is very brisk.

Warehouse Prices Advance

Pittsburgh, Feb. 22.—Warehouses in the Greater Pittsburgh district last Friday advanced prices $5 a ton and now are quoting bars and shapes at 2.85c; rounds and squares, 2 inches and over in diameter, at 3.50c; plates at 3c and hoops at 3.50c. Warehouses are asking the list price for cold rolled steel shafting.

Warehouse Prices Advance $3

Chicago, Feb. 22.—Chicago warehouses have announced an increase of $3 per ton on plates, shapes and bars, effective Feb. 22. This brings bars from store to 2.75c, plates to 2.95c and shapes to 2.75c. No advance was made on steel sheets.

J. W. Aulson & Son, Lynn, Mass., and Chicago, have purchased the business of the Merrow Machine Co., Salem, Mass., and will continue the latter.

Locomotive Market Active

Lake Shore and Other Lines Buy Heavily—Large Car Orders Anticipated

New York, Feb. 22.—Reports again are current in the equipment market that the New York Central lines are contemplating a large purchase of cars. It is known that this system recently has been figuring on a limited number of cars, including 1,000 hoppers for the Pittsburgh & Lake Erie, and the fact that large orders for locomotives now are being placed, strengthens the belief that freight equipment in quantity will be purchased soon. At present, the New York Central lines have closed for about 150 locomotives and are figuring on 250 more. Of these, the Lima Locomotive Corporation received 95 and the American Locomotive Co. about 50. The locomotive market continues very active, the restraining influence being the inability of the builders to get sufficient steel. The Southern Pacific placed 20 with the American Locomotive Co. and there have been miscellaneous orders. The Chicago & Northwestern is negotiating for a large number. The order to the Baldwin Locomotive Works from the British government, reported a week ago, calls for 20.

The Southern Pacific has placed 600 additional automobile cars with the Ralston Steel Car Co. and 50 passenger types with the Pullman Co., increasing its recent purchases to about 4,200 cars. The Lackawanna Steel Co. has placed 700 hopper cars, with the American Car & Foundry Co. and 700 with the Standard Steel Car Co. The Cuba railroad has ordered 350 flat, 350 box and 400 cane cars from the American Car & Foundry Co. The Chicago & North-Western continues to negotiate for 3,500 to 4,000 cars and the Atlantic Coast line for 1,000 cars.

The Cuba railroad has placed 6,000 tons of rails, additional, with the Lackawanna Steel Co., which also has taken 3,000 tons of contact rails for the Interborough Rapid Transit Co.

Despite current reports that the recent inquiry for 12,000 tons of rails by the South African Railway & Harbor Co. will be satisfied in this country, late cable advices are that no action has been taken on this matter.

Large Inquiry Out

Chicago, Feb. 22.—The Chicago & North-Western railroad is asking figures on 4,000 cars and the indications are that the inquiry will result in a contract shortly. This involves 1,000 box cars, 1,500 gondolas, 500 automobile cars and 1,000 flat cars. Several other inquiries which are not new but which have lagged, are now taking more activity and promise to result in sales. These include 1,000 box cars for the Southern railroad and 900 cars for the Illinois Central.

Rails and Track Equipment

Pittsburgh, Feb. 22. — The Carnegie Steel Co., on Feb. 21, advanced prices of light steel rails $3 a ton to 1.85c for sections weighing from 25 to 45 pounds for carload lots. The usual extras for less than carload tonnages prevail. Track bolts have been advanced sharply to a minimum of 3.25c as against the previously prevailing nominal price of 2.50c. Angle bars continue to be offered at a spread from 1.50c to 1.75c. Standard railroad spikes have been put up $3 a ton to a minimum of 2.50c.

Place Rail Orders

New York, Feb. 22.—The Long Island railroad has closed for 8,000 tons of rails with the Bethlehem Steel Co. The Central of Georgia has placed 10,000 tons of rails with the Tennessee Coal, Iron & Railroad Co. The Alaska Engineering Commission will take bids at Seattle March 6 on about 15,000 tons of open hearth rails, 7,000 kegs of standard spikes and a quantity of other track material. The Southern railroad has been taking bids on an inquiry for 8,000 tons of rails and is expected to close for a larger tonnage.

Track Supplies Advance

Chicago, Feb. 22.—Sharp advances have been announced in railroad supplies, spikes being quoted at 2.50c to 2.65c, Chicago, track bolts at 2.75c to 3c, Chicago, and tie plates at $45 per ton and higher. This represents an advance of about $3 per ton on each item. In spite of these advanced prices, railroads continue to buy in considerable quantities.

Pipe Gains Strength

Pittsburgh, Feb. 22. — The price advances, announced last week, tended to stimulate the market for iron and steel pipe and it is not unlikely that quotations will be put up further at an early date. Some mills are refusing to book additional tonnages at prevailing quotations. Specifications are coming out in heavy volume and new inquiries are numerous. No large single contracts have been placed and individual inquiries do not involve heavy tonnages. Mills are unable to promise boiler tubes in less than from three to six months and shipments of seamless tubing are deferred five to seven months.

(For complete prices see page 462.)

Relight Coke Ovens

At Gary, W. Va.—Monon Places Rail Order—Basic Sold in East

New York, Feb. 23. (By wire.)—The United States Steel Corporation has fired 1,200 coke ovens at Gary, W. Va., which have been idle for a long period. It is said arrangements are being made to start the isolated plants at Steubenville and Zanesville, O., which also have been idle for several years. The Monon railroad has placed 7,000 tons of standard rails with the Illinois Steel Co. Other scattered rail orders amount to about 18,000 tons. The Illinois Central railroad is about to close a large car order. A Trenton steelmaker has closed for several thousand tons of basic pig iron.

Ship Orders Huge

New York, Feb. 23. (By wire.)—Total orders for merchant vessels placed in the United States since the active movement began more than a year ago are estimated in well informed circles at about 275 with a registered tonnage of over 1,000,000. W. R. Grace & Co. has placed two more boats with Wm. Cramp Ship & Engine Building Co., Philadelphia, and the Coastwise Transportation Co., New York, has planned two more vances announced last week, tended to Co., Camden, N. J.

Tonnage is Reserved

New York, Feb. 23. (By wire.)—Reports of heavy sales of steel bars for last half shipment to implement manufacturers in the Chicago district find no official confirmation from the largest sellers. It is understood, however, that reservations have been made, but these have not yet been converted into actual sales. The prices that are likely to prevail on implement business still are indefinte.

The Thomas Iron Co. will blow in, about the middle of March, its second Alburtis, Pa., furnace. This will place five stacks in operation, the others being, two Hokendauqua, one Alburtis and one Hellertown. A second Hellertown furnace may be started later.

Cleveland Iron Highest in Years

Attempts of Government to Fix Maximum and Minimum Prices Result in Confusion—Wages Advanced by Midland Board—Zeppelins Threaten Steel Plants

Office of *The Iron Trade Review*,
Prince's Chambers, Corporation St.,
Birmingham, Eng., Feb. 4.

The optimists who foretold a rapid rise in pig iron values have been fully justified this week by an increase of nearly $1.20 on the week. Yesterday's quotations were $21.06 for ordinary pig iron. The present prices are the best for 42 years. Naturally, this run has caused some excitement, and speculators are now fully alive and exercising a material stimulus on the market. A feature of the Cleveland business is the heavy inroad made into stocks, which now stand at only 94,000 tons. The withdrawals from stock during January were 17,000 tons, although the shipments only reached 4,000 tons. If exports had maintained even an average, the claims upon the stocks must have been very much heavier. It is quite clear that demand has gone beyond supply. But it is very significant that this rapid advance appears to be restricted to the Cleveland district. Elsewhere prices are firm, but without any sign of inflation. At the Birmingham market, prices were slightly stronger, the rise probably being about 60 cents on the week. But this is mainly due to increasing difficulties of production. Pig iron will, of course, share in the result of the Midland wages board returns, referred to elsewhere, under which finished ironworkers get an increase of 7½ per cent. A corresponding advance will be made to furnacemen, although they are not linked up with the board. There is no great keenness to buy pig iron in the Midland market, in view of the government having fixed a minimum price and consumers consider themselves able to take the risk of any possible advance. So far, Staffordshire prices have not been formally fixed by the government, and it is thought likely that the publication of pig iron prices will be postponed until some progress has been made in the settlement of the figures for finished iron. The difficulty of the government is that makers can easily obtain much higher prices both for raw and finished material than those suggested as the trade maximum. Thus while $38.40 has been suggested for cold blast pig iron, the sellers have no difficulty in making $42. A further conference with smelters is to be held shortly when it is hoped that something definite will be arrived at. There is still a keen demand for East Coast hematite and apparently there is readiness to buy forward, but producers are sold to the end of June and are asking $33.60 for mixed numbers for third quarter delivery. The present price is $32.40. As the local authorities are inclined to take drastic action with regard to the showing of light at night, the iron output is very likely to be affected. Certain Staffordshire furnaces have turned off the blast for several hours on every night since the Zeppelin raid, and this must reduce the output, while adding very considerably to the cost of production. On the report of the appearance of a Zeppelin, the workmen at one Staffordshire works immediately dropped their dampers and made tracks for home. The price of iron will also be affected by the increasing cost of furnace fuel. The demand for steelmaking irons continues as keen as ever.

Finished Iron and Steel

Returns have been issued this week by the Northern & Midland wages boards relative to selling prices and wages during November and December. The Midland board reports an average selling price for bars, angles and tees, plates and sheets, hoop, strip and miscellaneous, of $53.84, as compared with $50.08 for the previous two months. This carries a rise of 18 cents per ton for puddlers and 7½ per cent for forge and millmen. This makes an advance on wages for the year of 40 per cent and gives some idea of the opulent times through which ironworkers are passing. The northern board shows an average selling price of $45.31, and awards its work people the same advance in wages. The rise in the northern average price for the year has been $12.48, but in the Midlands the present price of $53.84 compares with $35.54 a year ago. The finished iron business is somewhat dislocated at present by the government effort to limit prices. As in raw material, the chief difficulty arises from the fact that the government wishes to fix a maximum at a price below that easily realized by the seller. For instance, common bars are now sold at $72 for early deliveries, but the government suggests $67.20 as the outside figure. The same obstacles arise with other descriptions. There are still large demands for small sizes of bars, small rounds, tank plates, black sheets and stamping sheets. Demand shows no signs of decreasing and steel consumers are so anxious to get supplies that in some cases they are asking makers to state whatever price they please if only they will give deliveries. Leading makers of galvanized sheets have withdrawn from the market owing to their inability to obtain sheet bars, spelter and pickling acid at prices which will carry a profit. There is great difficulty in getting semi-finished material, such as blooms, ingots and puddled bars, while billets appear to be as scarce as ever. Confusion in regard to the government maximum is growing. The figure of $49.80 for sheet bars, fixed in Wales recently as the government maximum, has been frankly abandoned because it was conditional on a price of hematite at least $3.60 below that now prevailing. At Manchester this week, one maker of plates quoted openly $60, delivered, which is $3.60 more than the maximum announced. The same thing is applicable to other products and, so far, government intervention seems to have been a failure. A much sterner attitude will have to be taken up if these prices are to be operative. But so far nothing has been said about penalties. Generally speaking, there seems to be no limit to the demand for steel products. Nearly all the production at leading centers like Sheffield and Glasgow, is preferentially for the allied governments, and there is not much left for the ordinary consumer. The time would appear to be too far distant when certain steel productions, including descriptions of cutlery, will have to be suspended for the time being. Among other industries receiving short supplies is that of ship building. The great shortage of tonnage is stimulating business even at the present high prices, and some Clyde ship builders are said to have orders on hand sufficient to last them for a couple of years at least. The tinplate trade is moderately employed, production apparently just about meeting demand. In addition to the large plant extensions at Sheffield, further open hearth furnaces have been decided upon, the erection of which is to commence at once.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

F. L. Fay has been elected president of the Greenville Steel Co., Greenville, Pa., to succeed Fletcher Goodwill, Jamestown, N. Y.

R. F. Brown, of Fitz, Dana & Brown, metals, New York, is leaving for Pinehurst, N. C., where he will spend a two weeks' vacation.

Daniel Oldham, of George Oldham & Son Co., manufacturer of pneumatic tools, Philadelphia, has left for the south. He is expected to return in March.

Wm. Ellis Corey is slated for a director of the Cuba Sugar Cane Corporation, which was recently organized to consolidate a number of sugar companies in that country.

Geo. W. Bacon, of the engineering firm of Ford, Bacon & Davis, New York City, has become associated with the export department of J. P. Morgan & Co.

John F. Smith, superintendent of the 40-inch mill at the Ohio works of the Carnegie Steel Co., Youngstown, O., has accepted the position of superintendent of rolling mills for the Algoma Steel Co., Saulte Ste. Marie, Ont.

Geo. F. McKay, secretary and treasurer of the Otto Coking Co., Inc., No. 6 Church street, New York City, since the organization of that company two years ago, has resigned, effective March 1.

C. L. Taylor, chief engineer of the Morgan Engineering Co., Alliance, O., left for Russia Feb. 21 on the BERGENSFIORD. He will remain in that country a month or two on a visit for the company.

E. R. Stettinius, head of the export department of J. P. Morgan & Co., which is purchasing in this country large quantities of ammunition and other supplies for the entente governments, sailed for London from New York Feb. 19.

James Verner Critchley, who last July disposed of the two plants of the Critchley Machine Screw Co., in Worcester, Mass., to the R. B. Phillips Mfg. Co., a $400,000 Massachusetts corporation, in which he became a director, has been elected president and treasurer of the company, succeeding Ralph B. Phillips, Brookline, Mass., who remains as a director. Mr. Phillips also has resigned as treasurer and general manager of the American Steam Gage & Valve Co,. Boston, which, since the European war, has received several million dollars' worth of munitions contracts.

Roy C. McKenna, president of the Vanadium Alloys Steel Co., Pittsburgh, has written a very interesting article on Tungsten Mining in Colorado. A copy of this article will be mailed free on application to the Vanadium Alloys Steel Co., Pittsburgh.

Myles E. Ewing, sales manager of the Kirk-Latty Mfg. Co., Cleveland, for the past seven years, has resigned from that company and has accepted the position of secretary and sales manager of the Falls Rivet Co., Kent, O.

A. M. Stewart, Knoxville, Tenn., has been appointed resident agent for the Matthew Addy Co., 720 Rookery building, Chicago. R. E. Lundgren, formerly associated with Hickman, Williams & Co., has been made pig iron sales manager in the same office.

J. F. Brittingham, for the last four years connected with the Crocker-Wheeler Co., Ampere, N. J., at Pittsburgh, has been appointed Pittsburgh district manager of the Cleveland Crane & Engineering Co., Wickliffe, O., with offices in the First National bank building, Pittsburgh.

W. F. Roberts, general superintendent of the Lehigh plant of the Bethlehem Steel Co., has been made a vice president of the company. H. E. Lewis, who was recently appointed assistant to President E. G. Grace, of the Bethlehem Steel Co., has been made a director.

Leon W. Campbell, for many years assistant manager and later general manager of the Woonsocket Machine & Press Co., Woonsocket, R. I., is the president and general manager of a company just incorporated under the laws of Massachusetts, known as the Campbell Textile Machine Co., capitalized at $200,000. The new company has purchased the textile machinery business of the Potter & Johnstown Machine Co., Pawtucket, R. I., and has acquired a large and modern plant in Auburn, R. I.

J. R. Wilson, sales manager and second vice president of the Crocker-Wheeler Co., Ampere, N. J., has resigned to take up activities in other fields. Mr. Wilson has been associated with the Crocker-Wheeler Co. for 16 years, taking charge of sales operations in 1910.

C. L. Taylor, chief engineer of the Morgan Engineering Co., Alliance, O., left for Russia Feb. 21 on the BERGENSFIORD. He will remain in that country a month or two on a visit for the company.

H. E. Field has been re-elected president of the Wheeling Mold & Foundry Co., Wheeling, W. Va. C. C. Woods, who has been a director of the company for a number of years, has been elected treasurer. Other officers follow: Chairman of the board, C. E. Blue; secretary, Harry S. Bradley; assistant treasurer, Hullhein Quarrier.

E. T. Stotesbury has been elected chairman of the board of the Reading Iron Co., Reading, Pa. F. C. Smink again has been made president; George Schupmann, vice president and general manager; Geo. W. Delaney, secretary, and Henry N. Yost, treasurer. The directors are Messrs. Smink, Stotesbury, Samuel R. Seyfert, Heber L. Smith and Jefferson Snyder.

Willis P. Davis, Louisville, Ky., for years prominent in the iron and steel field in Louisville, has been made general manager of the Knoxville Iron Co., Knoxville, Tenn., which he has been representing as sales agent. He will locate in Knoxville, where he will also be general manager of the Cross Mountain Coal Co.

Blow In New Furnace

Chicago, Feb. 21.—The second blast furnace stack of the Minnesota Steel Co., at Duluth, has been blown in and is now producing pig iron. It had been expected that this stack would be in operation several weeks ago but various delays put the date considerably forward. This gives the new steel plant a daily capacity of about 1,000 tons of pig iron and as soon as possible the remaining open hearths will be put at work and the output of steel billets doubled.

These billets are being shipped to Bayview works of the Illinois Steel Co., at Milwaukee, where they are worked into finished forms.

The Milwaukee Bridge Co., Milwaukee, has been awarded a contract for furnishing and installing a pair of steel gates at dams Nos. 16 and 17 in the Ohio river.

Freight Rates Hit Sky

Some Charges are More than Double the Cost of the Material

New York, Feb. 21.—Some of the freight rates, rail and water, which iron and steel products for export are absorbing, now are practically double the market value of the material. On a consignment of special bessemer iron for Italy, the ocean shipping companies, this week, quoted a rate of $1.85 per 100 pounds, or over $40 per gross ton. Bessemer iron for export recently has been quoted at $23 to $23.50, tidewater. On a shipment of railway track material to Vladivostok, Russia, the freight was $45 a ton. Of this $15 was for the rail haul to the Pacific coast and $30 was the ocean-carrying charge.

Reads Paper on Molding Machines

A. O. Backert, editor of *The Foundry*, Cleveland, read an exhaustive paper entitled "The History and Development of the Molding Machine, with Sidelights on Latter-Day Practice", before the Pittsburgh Foundrymen's Association, Monday night, at the Fort Pitt hotel, Pittsburgh. The talk was illustrated with 65 lantern slides, showing the application of molding machines to diversified classes of work. Mr. Backert cited numerous specific instances in which casting manufacturers have effected great economy by the installation of molding machinery. All previous records of attendance for the year were broken, more than 80 members being present.

Donner Joins Schwab

Philadelphia, Feb. 21.—W. H. Donner, chairman of the Pennsylvania Steel Co., in a public statement says he will be associated with Charles M. Schwab and the Bethlehem Steel Corporation, the new owners of the former company, "as to such services as I may be able to render during this year." Mr. Donner states he is to receive cash for his 38 per cent holdings. The Pennsylvania railroad and the Reading Co. will be paid in bonds for their interests.

Cement Plant Starts

Chicago, Feb. 22.—The new plant of the Universal Portland Cement Co., at Gary, Minn., a suburb of Duluth, has been placed in operation. One kiln will be used for a time until sufficient material is accumulated to allow the remaining three kilns to be put into service. The cement will be made from the slag of the two new blast furnaces of the Minnesota Steel Co., at Duluth.

Blow In Another

Pittsburgh, Feb. 23. (By wire.)—The Carnegie Steel Co. will apply the torch to No. 1 blast furnace at Mingo Junction, O., within the next three weeks. The company now is blowing 53 of its 59 blast furnaces. Reports that the furnace at Steubenville, O., would be blown in at an early date are without foundation.

Purchases Mold Foundry

The ingot mold plant of the Bollinger-Andrews Co., Pittsburgh, at Josephine, Pa., erected in 1914, has been acquired by the Marshall Founday Co., Pittsburgh manufacturer of ingot molds and heavy castings. The properties at Josephine consist of six large steel buildings, including a main foundry, a power house, a machine shop and auxiliary buildings. The foundry is divided into two departments. The plant has three cupolas, six 20-ton and three 35-ton electric cranes, together with complete machine shop, power house and auxiliary machinery. The metal for the works, which has a capacity of from 100 to 150 molds a day, is furnished by one of the Josephine furnaces of Corrigan-McKinney Co., Cleveland. The Marshall company announces that the plant will operate on both direct and cupola metal.

Oversubscribe Midvale Bonds

Lee, Higginson & Co., the Guaranty Trust Co. and the National City Bank, managers of the syndicate which undertook the selling of between $40,000,000 and $50,000,000 of new Midvale Steel & Ordnance Co. 5 per cent convertible bonds, closed the subscription books yesterday noon, with the announcement that the amount available had been heavily oversubscribed. The authorized issue is $50,000,000, but the amount to be placed will depend upon the Cambria stock turned into the Midvale in accordance with its offer of $81 a share.

The plant of the Farist Steel Co., Bridgeport, Conn., was badly damaged by fire on Feb. 16. One estimate sets the loss at upward of $450,000. The blaze started in the rolling mill and extended to the three main buildings of the plant.

New Plan Proposed

Safety Council May Become International in Scope

Washington, Feb. 22.—The iron and steel manufacturers' section of the National Safety Council, here in connection with the government's safety first exhibit at the national museum, at an executive session had laid before it a suggestion by Canadian delegates that the organization be made international. It was pointed out that such a plan would be beneficial as the organization is already doing effective demonstration work in many countries. The council, it was stated, is "successfully competing against the European war in its ambition to save more lives than are being killed in battle."

W. H. Cameron, national secretary, and Lew R. Palmer, first vice president of the organization, met with officers of the iron and steel section. The organization is composed of 50,000 employers representing 2,500,000 working people. A bulletin service showing the latest ideas in prevention of accidents and caring for injuries has been instituted. The general scheme of the organization is to get the manufacturers and employers in various industries together so that in conference they can investigate and work out the peculiar hazards of their line of business.

The question of making the safety organization international is to be taken up at the national convention to be held in Detroit in October.

The officers of the iron and steel section in conference in Washington are: J. M. Woltz, Youngstown, O., chairman; G. T. Fonda, South Bethlehem, Pa., vice chairman; E. M. Peake, Pittsburgh, chairman of membership and publicity committee; E. B. Morgan, Granite City, Ill., secretary; J. C. Smith, Indiana Harbor, Ind., chairman of committee on accidents—causes and remedies; R. J. Young, Chicago, chairman of standardization committee; E. R. Rose, Youngstown, chairman of program committee.

The Humphrey Co. of Kalamazoo, Mich., manufacturer of water heaters, has retained H. O. Swoboda, Pittsburgh, as consulting engineer for the purpose of designing a line of electric heaters.

The New York, New Haven & Hartford Railroad Co. will add 50 heavy engines of the Pacific type to its passenger service. They are to be heavier than any now in use on the system.

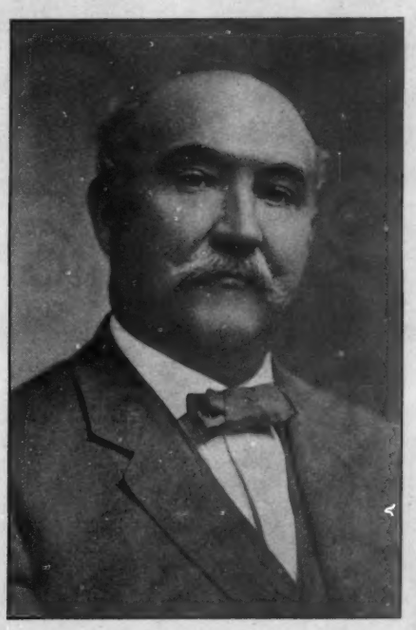
Builds Open Hearths at Youngstown

MOST STEEL companies signalize their growth by seeking to obtain control over the processes for converting raw materials into finished products. The new open hearth plant of the Youngstown Iron & Steel Co. allows this concern to supervise closely the various processes in manufacturing its sheet products

BY R. V. SAWHILL

AT A TIME when manufacturing processes are so highly specialized as at present, practically all steel companies, after passing through a period of preliminary expansion, find it necessary to take steps to secure definite control over the various raw materials entering into their finished products. Active competition does not permit marketing high grade products continuously when the manufacturer is obliged to depend on raw materials of varying quality. The merit of the product offered for sale must be assured by careful selection and elimination throughout its entire formative period. This supervision may be maintained either through actual ownership of the agencies for transforming the ore into semi-finished materials, or by maintaining a careful inspection of all of these products when they are purchased.

The universal adoption of the policy of centralized control by the larger steel working companies, tends to obscure its comparatively recent origin. Most steel executives of today can recall the surprise occasioned 25 years ago by the announcement of the first plan for bringing ore mines, lake freighters, blast furnaces and steel plants under unified control. Yet now we find numerous steelmaking companies that mine their own iron ore, transport it across the lakes or ocean in their own fleets, smelt it in their own blast furnaces and refine the pig iron in their own steel furnaces for delivery to the finishing mills.



JOHN O. PEW,
President Youngstown Iron & Steel Co.

This ambitious expansion has greatly improved the quality of steel mill products. The advertising campaigns waged only during the past few years on the improved quality resulting from the centralized control of every manufacturing process, has attracted deserved attention.

This refinement of control is generally considered in its relation to the steel plant's entire output. It is unusual, therefore, to find a plan for unified control conceived and carried out largely for the purpose of improving and maintaining the quality of one special product. This, however, was the underlying motive that led the directors of the Youngstown Iron & Steel Co., Youngstown, O., to approve the construction of an

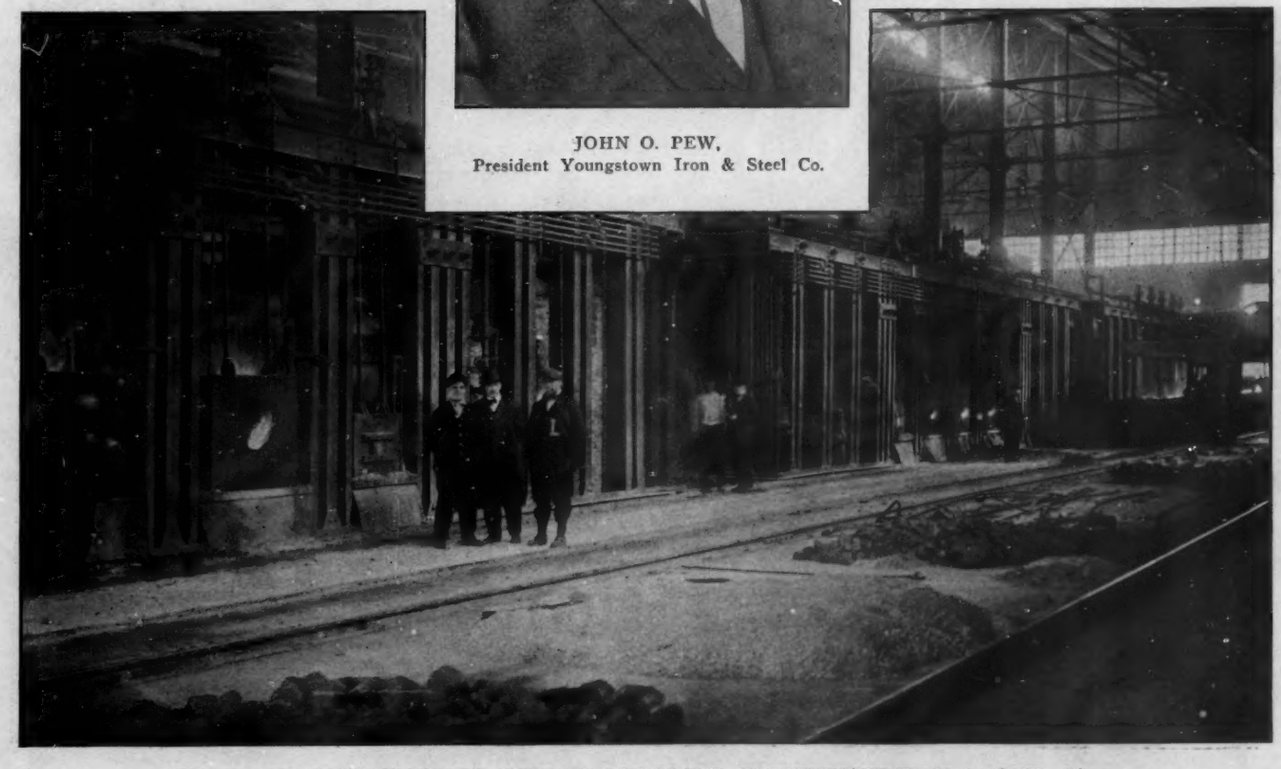


FIG. 1—CHARGING FLOOR OF OPEN-HEARTH PLANT, YOUNGSTOWN IRON & STEEL CO.

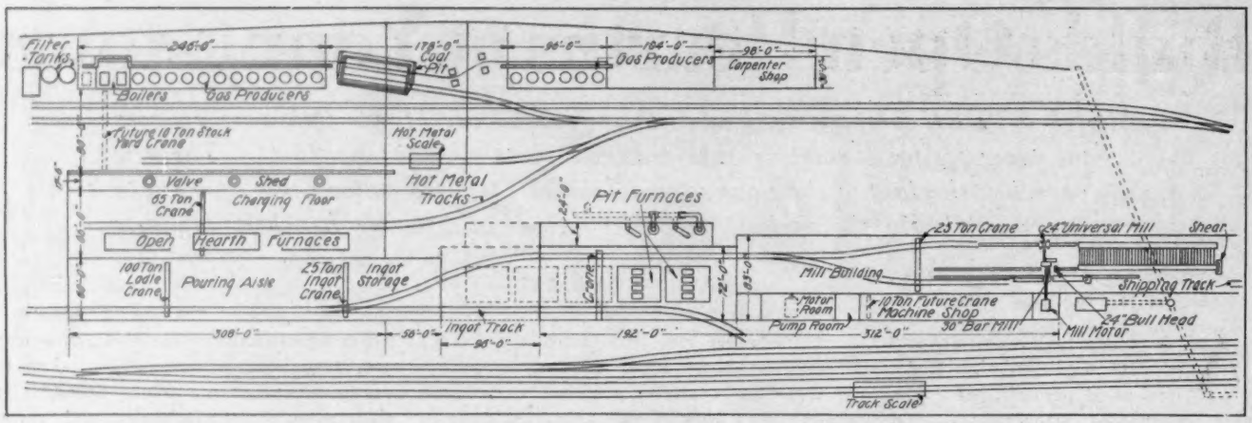


FIG. 2—GENERAL PLAN OF LOWELLVILLE OPEN-HEARTH PLANT

open hearth plant to supplement its sheet mills.

The Youngstown Iron & Steel Co., originally organized to manufacture roofing, for a number of years has been engaged largely in the production of sheets and sheet products. In addition, the company has specialized for a number of years in the making of deep stampings while in the 10 years since its inauguration, the pressed steel department has grown until the company is now one of the largest pressed steel workers in the country. During the past five years, considerable experimental work has been carried on by the company to develop a sheet with high rust-resisting properties. The results of these experiments are embodied in a dead-soft steel sheet alloyed with copper, which the company now manufactures. The approval of the plans for building an open hearth plant rested almost entirely upon the desire to supervise the manufacture of these sheet products from the ore mine to the shipping platform. Their production was felt to be more of a quality than a tonnage proposition.

This control extends back beyond the open hearth furnace, owing to a long-term contract that was made with the Ohio Iron & Steel Co., before work was begun on the steel plant. The Ohio company operates the Mary blast furnace at Lowellville, O., and the Youngstown Iron & Steel Co. has arranged to use the stack's output. The pig iron is produced according to the analysis desired by the steel company. The quality of the blast furnace product, in turn, is assured, as the Ohio Iron & Steel Co. controls an old range property that insures an uninterrupted ore supply for a number of years.

Choice of Location

The Youngstown Iron & Steel Co.'s main plant, called the Haselton works, is located within the city limits of Youngstown. The Mary furnace is about 3½ miles away and the difficulties that would be encountered in transferring hot metal across such a distance, coupled with the problems involved in securing land for extensions at the Haselton site, determined the present location of the steel plant at Lowellville within a few hundred yards of the blast furnace. The steel works and blast furnace are connected by a railroad which the company built, and over which hot metal is carried directly onto the open hearth charging platform.

Ground was broken for the steel plant in July, 1914, and the first ingot was poured on July 31, 1915. The new plant includes three 75-ton open hearth furnaces, 18 gas producers, a 30-inch bar mill and a 24-inch universal plate mill. The products are sheet bars, billets, slabs and universal plates. The older works at Haselton comprises eight sheet mills, a jobbing mill, a 72-inch plate mill and galvanizing, formed sheet products and pressed steel departments. The output of this plant includes black, galvanized and blue annealed sheets, universal and sheared plates, steel roofing and fireproofing, and pressed steel specialites.

The ladles in which the hot metal is brought from the blast furnace are of 40 tons capacity. They are transported along the entire length of the plant and returned over the hot metal tracks shown in Fig. 2. After being weighed, the ladles are brought directly to the charging platform and the molten metal is discharged into the furnaces. This operation is shown clearly in Fig. 7. After being poured into ingots the steel is transported to the soaking pits, and thence to the rolling mills, the arrangement of the tracks and buildings being shown in Fig. 2.

The sheet bars, after being rolled and sheared, are loaded into specially designed cradles for shipment to the Haselton plant. These cradles are slightly shorter than the width of a

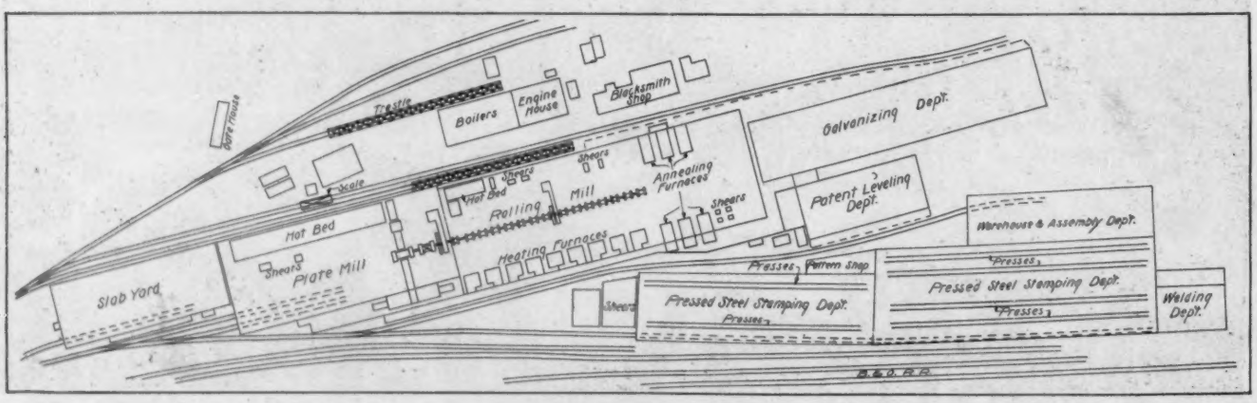


FIG. 3—ARRANGEMENT OF BUILDINGS AND EQUIPMENT AT HASELTON WORKS

FIG. 4—POURING AISLE SHOWING POURING PLATFORM AND RUNNERS FOR BOTTOM-POURING INGOT MOLDS

FIG. 5—MAIN AISLE IN PRESSED STEEL DEPARTMENT

railroad car. Their design permits the sheet bars to be piled easily, while the loaded cradles can be conveniently picked up and placed in the cars by a crane. At the Haselton plant, these cradles are unloaded by an electric traveling crane and placed directly in front of the sheet and pair furnaces.

The steel mill is located on the side of a hill, so that it was necessary to build retaining walls at several points where deep cuts were taken. These walls serve a double purpose, one forming a side for the coal storage pit, while another ultimately will carry the rails for a traveling crane over the storage yard. As completed, the plant is built at three different levels. The rolling mill and pouring floor of the open hearth building are on one level. The storage yard and charging platform are 18 feet higher while the gas producers are about 10 feet above this level.

The steel mill building is 308 feet long and 126 feet 6 inches wide. The charging floor is 66 feet wide and the pouring aisle is 60 feet 6 inches. The building is of steel construction, sheathed with special siding manufactured by this company. It has a monitor type roof. The crane rails are 39 feet above the floor level, the height to the eave line being 54 feet.

The general axis of the plant runs from east to west, the open hearth furnaces being at the east end. The hot metal scales are located near the southwest corner of the furnace building. These scales are of the Fairbanks type. The ladles, after reaching the charging floor, are handled by a 60-ton Morgan charging crane. The floor charger also is of the Morgan type. Scrap from the storage yards is loaded in charging boxes by locomotive cranes, two Brown-Hoist machines now being used for this purpose and for general yard service. The stock yard is about 50 feet wide and extends the entire length of the mill building. It has an estimated storage capacity of 15,000 tons. A 10-ton yard crane will be installed later for storage yard service. The dolomite and ferro-manganese are stored in a pit at the extreme east end of the building, being handled from the pit by the charging crane.

Open Hearth Furnaces

Provision has been made for increasing the number of furnaces in the future, the new ones to be built east of No. 3 furnace. The general arrangement of the open hearth building is shown in Fig. 6, while views of the charging floor and furnaces are shown in Figs. 1 and 7. These furnaces are provided with interesting water cooled burners which were designed by one of the foremen. At the present time the furnaces are fired by natural gas but the producer plant will be put in operation within a short time.

The pouring aisle is 55 feet from center to center of crane rails. A Morgan 150-ton ladle crane is employed for handling the ladles, which are of 100 tons capacity. This crane is supplemented by a 25-ton Morgan ingot crane, a 10-ton Cleveland pit crane and by electric jib cranes for handling the spouts.

One of the most interesting innovations in the steel company's open hearth operation, is the employment of the bottom-pour method for casting ingots. The arrangement of the molds and movable pouring platform is shown in Fig. 6, while the platform itself is illustrated in the center of Fig. 4. Five ingot molds are filled at one time, the steel being poured from the ladle into a central mold from which it passes through suitable gates to the adjacent molds. The operation is controlled by a workman stationed on the movable platform, the latter being shifted from one set of ingot molds to another as the pouring progresses. There are five 5-mold ingot sets.

After being stripped the ingots are taken direct to the soaking pits; provision, however, has been made for storing them in a 56 x 60-foot building adjoining the furnace building. A machine also is located at this end of the building for grinding the brick

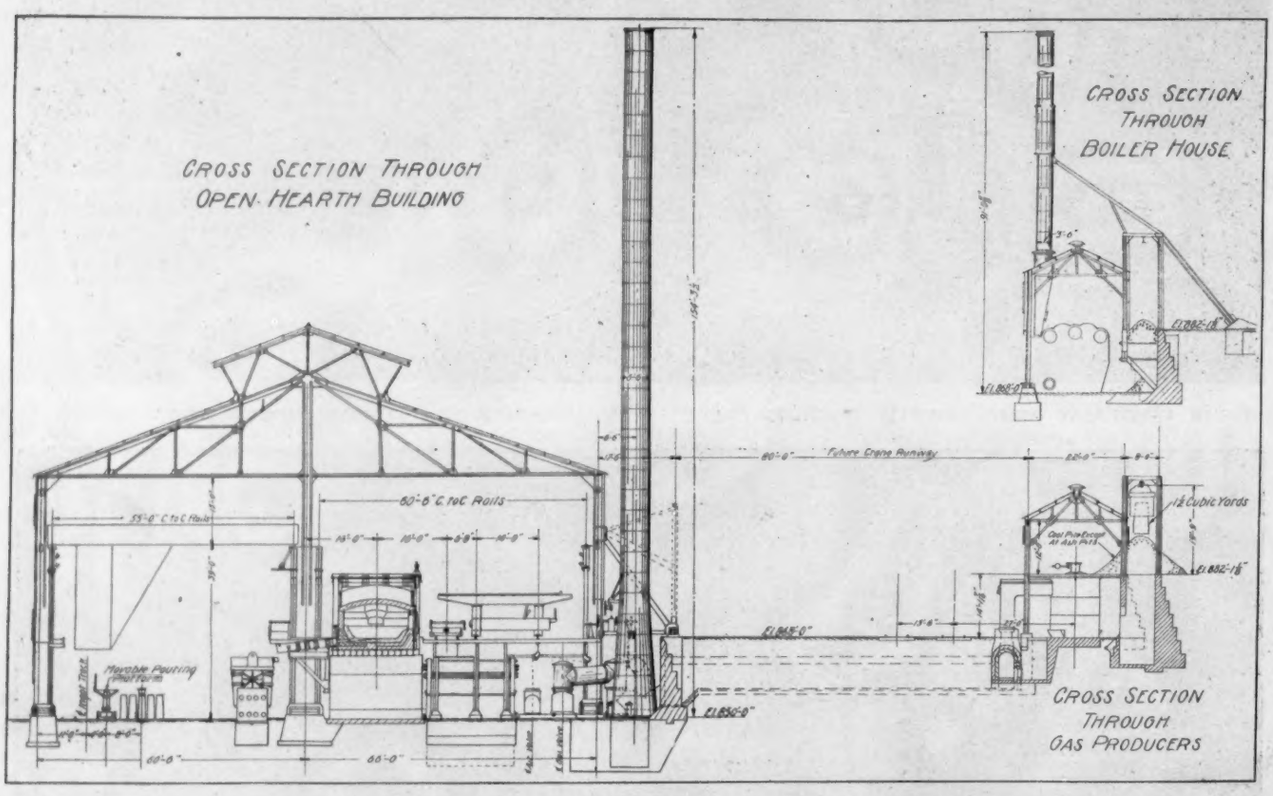

CROSS SECTION THROUGH OPEN HEARTH BUILDING
CROSS SECTION THROUGH BOILER HOUSE
CROSS SECTION THROUGH GAS PRODUCERS
60'-0" C to C Rails
Future Crane Runway
1½ Cubic Yards

FIG. 6—CROSS-SECTION THROUGH OPEN HEARTH AND GAS PRODUCER PLANTS

FIG. 7—CHARGING AN OPEN HEARTH WITH HOT METAL FROM MARY BLAST FURNACE

and chrome ore used in lining the spouts and patching the furnaces.

The four-hole soaking pit furnaces are employed for reheating and soaking the ingots. These furnaces are commanded by a 10-ton pit charger. Provision has been made for the construction of three additional furnaces, which will give the company sufficient capacity to reheat 20 ingots at a time. The soaking pit building is 72 feet wide and 192 feet long. When the additional furnaces are installed its length will be 288 feet. A 24-foot bay adjoins this building on the south and houses the gas handling equipment. The pits are now being fired with natural gas but it is expected to put them on producer gas at the same time that those for supplying the open hearth furnaces are fired.

FIG. 8—BAR AND UNIVERSAL MILL AT LOWELLVILLE WORKS

The rolling mill building is 600 feet long and 56 feet wide. Adjoining this structure on the north is a 27-foot bay which contains motor and pump rooms machine shop and testing laboratory.

The three-high 30-inch bar mill and the 24-inch universal plate mill are illustrated in Fig. 8, the view being taken from the cooling bed. The mill equipment was furnished by the William Tod Co., Youngstown. The mills are commanded by a 25-ton Morgan crane.

An unusual feature of this mill is the centralization of the driving pinions for three sets of rolls in one set of housings. This housing is centrally located between the bar and universal mills, and the spindles to these mills and to the 24-inch bull head rolls all lead from the one set of pinions. This arrangement necessitated an unusually long driving shaft from the motor room, which, however, has given satisfactory results in operation. The compact arrangement of the pinion housings economizes considerable space. The mills are actuated by a 2,000-horsepower General Electric motor, operating at 2,200 volts. Current is purchased from the Mahoning & Shenango Railway & Light Co., entering the plant at 22,000 volts. A General Electric 700-horsepower, motor-generator set is located in the motor room at the east end of the rolling mill. The motors driving the mills and the hydraulic pumps operate at 2,200 volts. Transformers are provided for stepping down the current for lighting and other purposes.

After passing the 24-inch bull head rolls the sheet bars are run out onto the cooling bed. The bars are trimmed in a slab shear, which is equipped with a 40-inch knife and has capacity for shearing four ¾ x 8-inch bars at one stroke. This shear is mounted on a truck and rails, being shifted from one side of the bed to another to meet the alternate operation of the bar and universal mills. The sheet bars, after being sheared, drop into a water box. After cooling, the box is lifted out of the pit by the crane, the scale removed, and the bars are loaded into a shipping cradle.

Of the 18 gas producers, 12 are designed to furnish fuel to the open hearth furnaces and six will supply the soaking pits. These producers are of the Laughlin hand-fired type. They are furnished with steam from two Stirling water tube boilers. The arrangement of the gas producer equipment is shown clearly in Fig. 6. The 12 producers for the open hearth furnaces are built in a continuous series, the boilers being located at the east end. The producers are spaced on 16-foot centers, giving a total length of 192 feet. A continuous pit for handling coal and ashes parallels the producers on the south for the entire distance and extends to the boilers. This pit is commanded by a monorail, provided with a 1½-yard grab bucket. The distance from the bottom of the pit to the monorail track is 19 feet 9 inches. The gas producer house is constructed of concrete and steel. The monorail tracks pass over a large storage pit at the west end of the producers; they also extend to the six soaking-pit producers. These are located 178 feet west of the open hearth producer building.

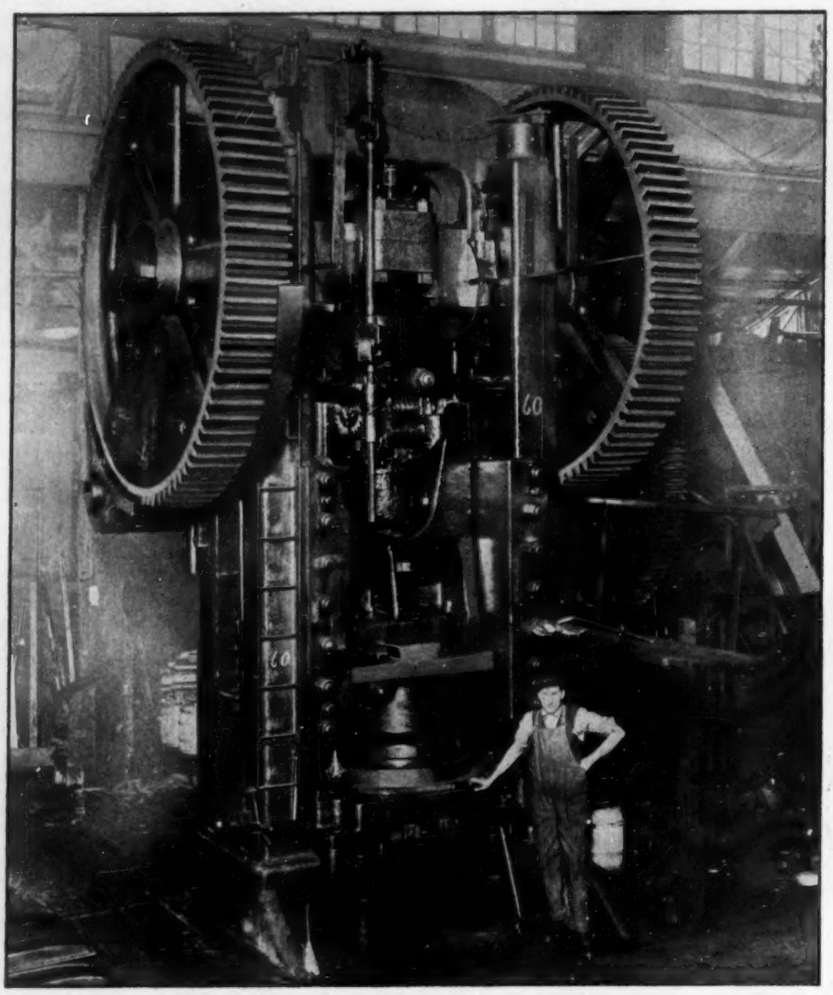


FIG. 9—PRESS FOR HEAVY STAMPINGS

The two Cameron, 5-inch, six-stage centrifugal pumps employed for furnishing water, are of unusually large capacity, delivering 600 gallons per minute at 550 pounds pressure. It is said to be the first installation in this country of this type of pump with such a large capacity. Each pump is direct connected to a 300 - horsepower General Electric motor. Water is secured from the Mahoning river, two single - stage Cameron centrifugal pumps being provided. They are driven by General Electric motors, each pump having a capacity of 75,000 gallons per hour. All water, after being used, is filtered and returned to the pumping system. The filter system was installed by the W. B. Scaife & Sons Co., Pittsburgh. The water is run through a lime tank into a large agitating tank. After the sediment has settled, the clean water is stored in two tanks, each having a capacity of 16,800 gallons. The filter house and tanks are located adjacent to the gas producer boiler house.

The testing laboratory, which is located in the rolling mill annex is unusually well equipped. An Olsen machine for conducting physical tests is provided, together with a small electric furnace, tin bath and gas annealing furnace. All of the laboratory furnaces are subject to pyrometric

control. The chemical laboratory is located in the temporary office building, complete facilities being provided for making analytical determinations. The machine shop, which also is located in this annex, is equipped with two drill presses, 42-inch, 18-inch and 14-inch lathes and a shaper.

The company's active interest in the welfare of its workmen is demonstrated by the first-aid hospital. This building, which was one of the first structures erected, contains facilities for treating minor injuries and for giving first-aid treatment in case of more serious accidents. The hospital is under the constant supervision of a competent attendant, who also serves as a safety director for the plant generally. The plans for the Lowellville plant were prepared by Julian Kennedy, engineer, Pittsburgh.

The general arrangement of the Haselton plant is shown in Fig. 3. As stated previously, this plant is provided with eight sheet mills, a jobbing mill, a plate mill, and expanded metal, metal lath, roofing and pressed steel departments.

The plate mill is of the 72-inch three-high type, rolling plates up to 60 inches in width. It is equipped with tilting and cooling tables, straightening machine and shears. The mill was furnished by the United Engineering & Foundry Co., Pittsburgh. All the auxiliary equipment is electrically driven. The mill is served by two 40-foot Laughlin continuous heating furnaces. Its monthly capacity is approximately 5,000 tons.

One of the sheet mills is a 30 x 60-inch, two-high finishing mill with roughing rolls of the same size. This mill is used for rolling sheets 54 inches wide and narrower, from 3/16 to 1/40-inch in thickness. It is operated as a jobbing mill and is equipped with a double-end blue annealing furnace, roller leveler, hot bed and shears. The remaining sheet mill equipment includes 29 x 48-inch, 29 x 42-inch, 29 x 40-inch, three 29 x 36-inch and two 29 x 32-inch mills. These are provided with the usual complement of roughing stands, sheet and pair furnaces, and roller levelers. Four stands of cold rolls also are installed. There are four 4-box coal-fired annealing furnaces, two roller levelers for handling cold sheets and two hydraulic stretching machines.

The sheet mills are served by five Shaw type electric cranes, three being of 35 tons and two of 10 tons capacity. The coal for the sheet mill is unloaded from drop-bottom cars onto a Link-Belt conveyor, and dumped into 5-ton steel coal boxes, which are transferred to the furnaces by cranes.

The galvanizing department is equipped with three roller galvanizing machines, designed by the company's own engineers. These machines can handle sheets up to 54 inches in width, and varying in thickness from 9/64 to 1/80-inch.

The pressed steel department has an annual capacity of approximately 15,000 tons and this capacity is being rapidly increased. It began operations on Nov. 8, 1905, under the direction of G. F. Danielson, who has been continuously in charge since that time. It is equipped with more than 60 presses, and can turn out stampings varying in weight from 50 pieces to the pound to those weighing 500 pounds each. The output consists very largely of specialties used in the agricultural implement and automobile industries, particularly such articles as motor oil pans for automobiles.

Twenty-five men are employed to operate the electric and oxy-acetylene welders, which are now in operation. All dies used in this department are products of the company's own tool room and include dies for many intricate shapes, especially adapted to its line of manufacture. Fig. 9 shows one of the large presses in the pressed steel department. All material is handled by electric traveling cranes, the equipment throughout being of the most modern type.

Electric power is generated by a 20 x 40 x 42-inch Cooper cross-compound engine, direct connected to a 500-kilowatt Crocker-Wheeler 230-volt

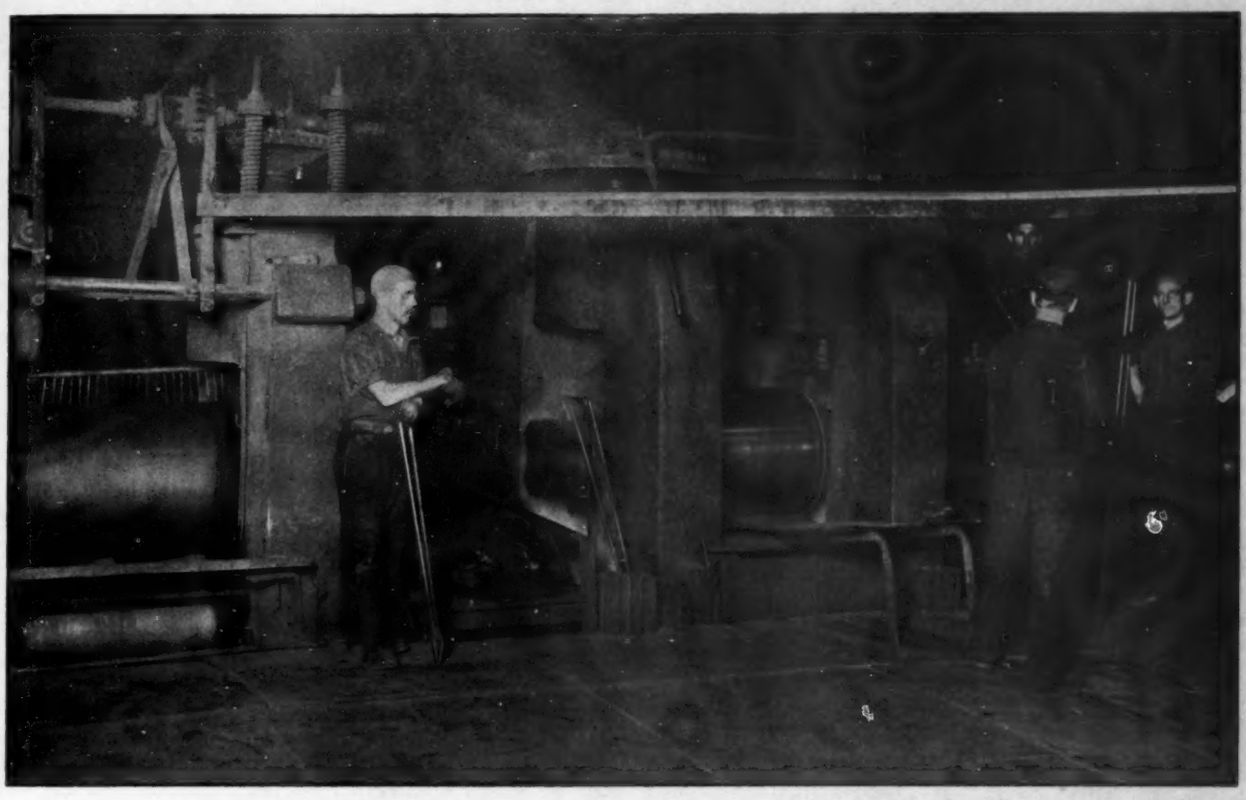


FIG. 10—ROLLING SHEETS AT HASELTON WORKS

generator. The auxiliary equipment includes one 100-kilowatt and one 200-kilowatt Bullock generator connected to Cooper corliss engines. The plate mill is driven by a 2,500-horsepower Cooper corliss engine. The sheet mill is actuated by a 1,500-horsepower Tod piston valve engine. The boiler plant comprises seven 500-horsepower Stirling water boilers.

The blacksmith shop is equipped with a Nagel-Beche hammer for forging. This hammer is driven by compressed air, the compressor and the motor which drives it, being mounted on the hammer frame.

A new pump house was built last year, water being secured from the Mahoning river. This building is brick and concrete. It is equipped with two 1,250,000-gallon De Laval single - stage, vertical centrifugal pumps, each driven by a 75-horsepower General Electric motor. Underground concrete conduits were built for bringing the water to the plant.

John O. Pew, president and general manager of the Youngstown Iron & Steel Co., has been actively associated with the steel industry for 22 years. Prior to that time, he was in the hardware business. A desire to engage in the steel business brought him to Youngstown in 1894, and within six hours after meeting Lucius E. Cochran, definite plans were agreed upon for launching a new company. The concern was incorporated under the name of the Youngstown Iron & Steel Roofing Co., on July 26, 1894, with Mr. Cochran as president; Mr. Pew, general manager; G. M. McKelvey, vice president; Mason Evans, treasurer, and C. S. Pew, secretary. The five officers composed the board of directors. The company originally manufactured roofing only and began operations with a force of 12 men. More than 2,400 workmen are now employed. Mr. Pew served as general manager until the death of Mr. McKelvey, in 1905, when he became first vice president and general manager. Following the death of Mr. Cochran, in 1913, Mr. Pew assumed the office of president and general manager. Mr. Cochran had been engaged in the steel business for a number of years, being associated with Andrews Bros. Co. before aiding in the organization of the Youngstown Iron & Steel Roofing Co. The Andrews company operated a blast furnace and sheet and bar mills, and was later absorbed by the Republic Iron & Steel Co.

The Youngstown company was originally incorporated for $12,000. In 1898 the capital stock was increased to $25,000 and in 1901 to $300,000. The company's activities were steadily broadened and in 1910 the name was changed to the Youngstown Iron & Steel Co., and the capital stock increased to $1,200,000. Following the decision to build an open hearth plant, the directors authorized an increase in capital stock to $3,000,000 to provide for the construction.

The sheet mill began operations in 1901 with four hot mills, one stand of cold rolls and a one-pot galvanizing department. Another mill was added in 1905, a sixth in 1907 and two in 1908. The jobbing mill was installed in 1910 and the plate mill in 1911.

The present officers are John O. Pew, president and general manager; H. W. Heedy, first vice president; C. A. Cochran, second vice president and secretary; Mason Evans, treasurer; C. B. Cushwa, general superintendent, and G. F. Danielson, manager of the pressed steel department. These officers with C. D. Hine and L. B. McKelvey, constitute the board of directors. Mr. Cushwa, who joined the Youngstown company in 1901, had been superintendent of rolling mills at the Republic Works of the National Tube Co., Pittsburgh. He has taken an active part in promoting the growth of the Youngstown company.

Seek American Steel

Steel knives are extensively manufactured in Spain, and one of the manufacturers, whose principal office is in Seville, is seeking supplies of steel for their manufacture on account of a shortage of raw material. He uses annually about 100 tons of steel, and has no objection to paying cash against documents for materials purchased. He desires to import through Seville or Valencia. His factory is in Alicante province.

American consular officers believe that the United States will be depended upon to supply the steel needed in Spain during the present war. Knives manufactured there are of special shape and size and Spanish manufacturers are known to produce a superior quality of goods. It is doubtful if American-made knives could take the place of the Spanish article, unless the American manufacturer were to secure samples and make exact duplicates. There is a call also for penknives and cheap safety razors.

The Toledo Electric Welder Co., Cincinnati, has issued a 40-page bulletin descriptive of its various types of spot welding machines, which are designed to join metal sheets at any desired point by a "spot" the size of a rivet. This is done by fusing the metal at the point desired and at the same instant supplying sufficient additional metal to force the molten particles together. Numerous models of the company's product are described and illustrated, several examples of actual welding practice being also depicted.

Book Review

Financing an Enterprise, by Francis Cooper; fourth edition; 524 pages; 5½ x 8¼ inches; published by the Ronald Press Co. and furnished by *The Iron Trade Review* for $3.50 net.

This book, as indicated by its title, is a manual of information and suggestion for promoters, investors and business men generally who may be interested in the problems of financing an enterprise. The work, which is very complete, is divided into six parts and 42 chapters. The scope of the book extends beyond the direct financing of an enterprise and includes its investigation, valuation, preparation and presentation, as well as its protection during the formative period. Also a discussion of the somewhat difficult matter of capitalization is presented, together with suggestions as to the use and adaptation of the corporate form. As an effective presentation and successful financing of an enterprise are not usually possible unless the point of view — often widely divergent—of both the man with the enterprise and the man with the money are known, and given due weight, the author treats the subject as far as possible from the standpoint of both parties.

The Cleveland Twist Drill Co., Cleveland, is sending to the trade a calendar which contains a reproduction of Robert Fulton building NAUTILUS, the first successful submarine, which was constructed on the Seine near Paris and launched in 1800. It was taken to the harbor at Brest where, manned by Fulton and two friends, it attacked and sunk an enemy's ship. NAUTILUS was a wooden vessel covered with sheet copper, 20 feet long and 6 feet in diameter. It was propelled by a sail while on the surface and by a series of hand levers, gears and a screw propeller while under water. The rise and descent of the boat was accomplished by water ballast compartments and force pumps.

Col. H. P. Bope, vice president and general manager of sales of the Carnegie Steel Co., Pittsburgh, addressed members of the Young Men's Business Club, Feb. 3 at a weekly luncheon on the Human Element in Preparedness.

Loss of Heat in Hot-Blast Mains

A MARKED drop in the temperature of the hot blast occurs between the stoves and blast furnace. Little effort has been made to overcome this heat loss and the conclusions presented by Mr. Wysor, these determinations giving the results of careful, comprehensive tests, will prove of value to blast furnace managers

BY R. J. WYSOR

MORE than two years ago, in making efficiency tests on our hot-blast stoves, I was surprised to discover a marked difference in temperature as indicated by a pyrometer inserted near a stove on blast, and the regular recording instrument situated near the bustle pipe. A special hole was then provided at the junction of the hot-blast main and the bustle pipe and portable pyrometers with bare fire ends were used, both at this point and in the stove necks. I had occasion to make a number of such tests on various stoves on the same furnace, the difference in temperature as shown by the two pyrometers varying chiefly with the temperature of the blast, and the distance of the stove from the furnace. However, this difference was always great, often averaging above 100 degreees Fahr. for the entire period of a stove on blast. Later, experiments were made with similar results on another group of stoves. The pyrometers used were properly standardized and checked against each other before and after each test.

Table I

DETAILED RESULTS OF TESTS
TEST 1

Date	Oct. 10, 1912
Furnace	"E"
Product	Stand'd basic
Time furnace in blast before test	7 months
Time furnace in blast after test	19 months
Stove	No. 5
Aver. atmospheric temp.	72 deg. Fahr.
Average wind velocity, miles per hour	5.8
Precipitation	None
Average blast pressure	16.3 lb.
Average free air blown per minute, at 62 deg. Fahr. and 30 in. barometer	32,000 cu. ft.

PYROMETER READINGS

Time a. m.	Pyrometer *A* deg. Fahr.	Pyrometer *B* deg. Fahr.
10.20	1,480	1,330
10.25	1,400	1,280
10.30	1,350	1,255
10.35	1,310	1,230
10.40	1,275	1,200
10.45	1,235	1,160
10.50	1,215	1,145
10.55	1,185	1,120
11.00	1,180	1,110
11.05	1,165	1,100
11.10	1,150	1,095
11.15	1,130	1,075
11.20	1,120	1,060
Average	1,246	1,166
Total time stove was on blast		65 min.
Direct average difference in temperature between pyrometers *A* and *B*		79 deg. Fahr.

A slight doubt still existed as to the accuracy of the results obtained, as subsequently explained. But corroboration of the magnitude of heat losses from blast furnace hot-blast mains has been obtained from two independent sources. H. A. Brassert, superintendent of blast furnaces, South Works, Illinois Steel Co., states that he has recently done some similar experimental work, and found temperature drops of the same order of magnitude. Also, C. R. Lyle, of the Armstrong Cork Co., has made some interesting theoretical calculations, based on the thermal conductivity of fire brick, for the particular conditions of several of our tests; and his theoretical interpolations, all facts being considered, check actual observations fairly well.

Method of Conducting Tests

The location of the pyrometer fire ends is shown in Fig. 1. This illustration shows the Bethlehem Steel Co's *G* blast furnace, hot blast stoves and main. Bare fire ends were used at positions *A* and *B*, being inserted so as to project about 8 inches inside the firebrick lining of the horizontal stove neck and hot-blast main respectively. Readings were taken simultaneously at both positions at three to five-minute intervals from the time the stove was put on until it was taken off blast. As a check on pyrometer *B*, the regular recording pyrometer was located only a few feet away in the hot-blast main. The results of the latter were slightly lower on account of the fire end being shrouded with asbestos packing in a metal tube.

Three possible sources of error were suspected: high readings of pyrometer *A*, due to radiation from heated brick work of the stove neck or adjacent parts of the stove; uneven temperature of the hot blast passing through the cross-section in which pyrometer *A* was located; low readings of pyrometer *B* due to leakage of the cold blast valve. Both direct and indirect information makes it unlikely that appreciable error has occurred due to any of these causes.

The accompanying diagrams and tables, selected from a number, show typical conditions for the two furnaces in question. Tests were not made on other furnaces, because of the objectionable feature of breaking out brick work in the hot-blast main, with resulting danger of hot spots.

Unfortunately, no tests were made on comparatively low blast heats. On account of smelting hard, lumpy ores, high blast temperature is usually carried at Bethlehem, and five stoves generally being operated. The two runs on No. 5 stove, *G* furnace, show unusually high blast temperatures and this particular hot-blast main, for engineering reasons, is considerably longer than normal. The results show the high losses obtaining for such conditions. The *E* furnace test is more nearly representative, though the average temperature is still higher than for furnaces smelting large percentages of Mesabi ores.

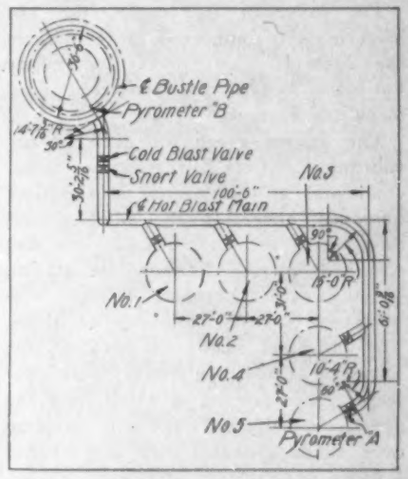


FIG. 1—PLAN OF HOT-BLAST MAIN AND CONNECTIONS

For purposes of calculation the following data in connection with *G* furnace and hot-blast main, with connections, are presented. The furnace is rated at 500 tons capacity. It is served by five three-pass McClure stoves, 22 feet in diameter and 100

Presented at the February meeting of the American Institute of Mining Engineers. The author, R. J. Wysor, is chief chemist, Bethlehem Steel Co.

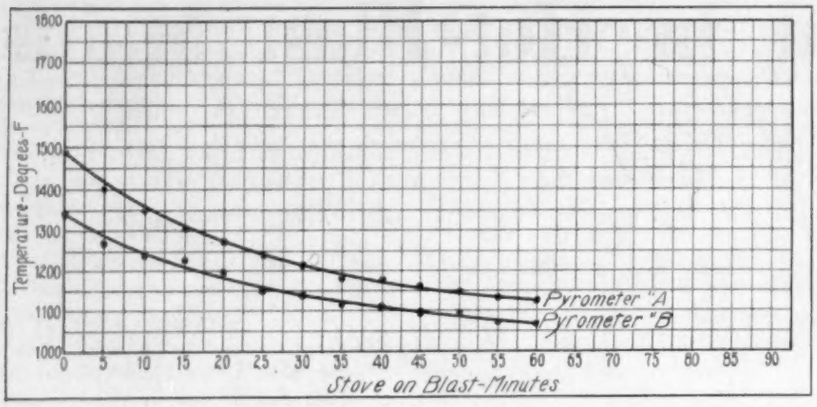


FIG. 2—TEST NO. 1—THE CURVES SHOW DIFFERENCE IN TEMPERATURE BETWEEN POINTS IN HOT-BLAST MAIN

feet high, connecting to the hot-blast main through Kennedy-Morrison hot-blast valves. The diameter, and the thickness of brick work in all the 500-ton furnace hot-blast mains are the same. The data are shown in Table IV.

For most of its length, the hot blast main is supported 15 feet above the ground. The stoves and entire hot-blast system are protected with black stack paint..

The figures given for each of the subsequent tests, represent actual conditions at the furnace at the time observed, excepting the wind velocities, which are averages for the day obtained by the Philadelphia station of the weather bureau, and little significance is to be attached to them. The hot-blast mains of both of the furnaces tested are fairly well protected from prevailing winds, and the actual velocity of the air passing over them probably did not exceed 4 miles per hour in any test.

The exact condition of the brick work in the hot-blast main could not, of course, be determined at the time of the tests. Only slight repairs were found to be necessary when the mains were opened after the preceding runs on the two furnaces, and, after being blown out again, the mains were still in fair condition, no general repairs being necessary. Obviously we may assume that no great erosion of the brick throughout the hot-blast system had occurred up to the time of the test. No pyrometer readings were taken for the first few minutes after the stove was changed from gas to blast. The results of three typical tests are given in Tables I, II and III.

Discussion of Test Data

The approximate amount of heat lost between the farthest stove and the bustle pipe, according to test 3, Table III, was calculated as follows:

Cubic feet free air blown per minute at 62 degrees Fahr. and 30 in. barometer	33,500
Pounds free air blown per minute at 62 degrees Fahr. and 30 in. barometer	2,548
Average temperature at stove No. 5, degrees, Fahr.	1,486
Average temperature at bustle pipe, degrees, Fahr.	1,382
Average difference in temperature, degrees, Fahr.	104

Using specific-heat data on the basis of constant pressure, we find:

Total sensible heat (above 62 degrees Fahr.) in air blown per minute at stove No. 5, approximately, B.T.U.	926,400
Total sensible heat (above 62 degrees Fahr.) in air blown per minute at bustle pipe, approximately, B.T.U..	856,400
Loss in sensible heat per minute, B. T. U.	70,000
Average loss per square foot surface per minute	26.86
Percentage loss in sensible heat above 62 degrees Fahr., per cent	7.7

If there is an appreciable pressure drop in the hot-blast main due to friction, and to heat lost by radiation and conduction, part of the above temperature and sensible heat loss would, of course, be accounted for as due to expansion of the blast with accompanying absorption of heat. We have not made tests to ascertain the actual change of pressure between the stoves and the furnace, nor have I seen any data published on this subject. However, whatever may be the loss of temperature due directly to blast expansion, it is reasonable to suppose that expansion of the blast in turn is largely caused by heat lost by radiation and conduction into the atmosphere.

From the foregoing data, it will be seen that in the tests on No. 5 stove, *G* furnace, we have measured the temperature drop due to only about three-fifths of the total radiating and conducting surface between the last stove and the furnace, along the direct path of the blast. Considerable losses also occur between the main and hot-blast valves of the other stoves. While the temperature will not continue to drop in the brick-lined bustle

Table II

Detailed Results of Tests

TEST 2

Date	Nov. 6, 1913
Furnace	"G"
Product	Bessemer
Time furnace in blast before test	13 months
Time furnace in blast after test	13 months
Stove	No. 5
Aver. atmospheric temp.	60 deg. Fahr.
Average wind velocity, miles per hour	6.1
Precipitation	None
Average blast pressure	19.0 lb.
Average free air blown per minute, at 62 deg. Fahr. and 30 in. barometer	33,500 cu. ft.

PYROMETER READINGS.

Time p. m.	Pyrometer *A* deg. Fahr.	Pyrometer *B* deg. Fahr.
3.00	1,720	1,560
3.03	1,700	1,550
3.06	1,670	1,530
3.09	1,660	1,520
3.12	1,645	1,510
3.15	1,625	1,500
3.18	1,610	1,480
3.21	1,595	1,470
3.24	1,585	1,460
3.27	1,570	1,450
3.30	1,550	1,440
3.33	1,535	1,420
3.36	1,525	1,410
3.39	1,510	1,400
3.42	1,500	1,400
3.45	1,490	1,390
3.48	1,475	1,380
3.51	1,460	1,380
Average	1,579	1,459

Total time stove was on blast	55 min.
Direct average difference in temperature between pyrometers *A* and *B*	120 deg. Fahr

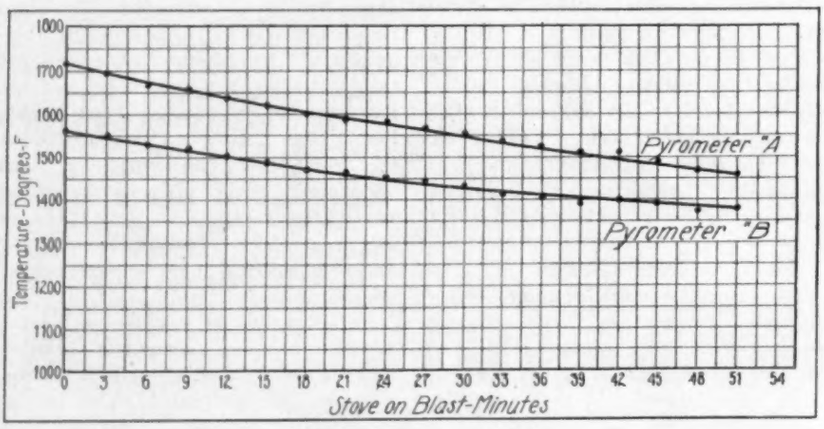


FIG. 3—TEST NO. 2—THE CURVES SHOW DIFFERENCE IN TEMPERATURE BETWEEN POINTS IN HOT-BLAST MAIN

pipe and leg pipes as rapidly as in the outlying sections of hot-blast main, it will still be appreciable; and though the total radiating and conducting surface of the bare blow pipes and water-cooled tuyeres is relatively small, the loss of heat per unit area is relatively great.

In the course of this investigation, I determined the average thermal loss due to cooling water from each hot-blast valve, with an average blast temperature of 1,360 degrees Fahr. and volume of about 33,000 cubic feet free air per minute under standard conditions, to be approximately 10,000 British thermal units per minute. This was done by measuring the discharge water from the valve and from the valve seat, and determining the temperature of affluent and effluent water. Under the conditions of Test 3, this would correspond to at least 15 per cent of the total heat loss measured in the part of the hot-blast system under investigation. The large water-cooled surfaces of the mushroom type of valve in general use, and the high thermal conductivity of these bronze or copper parts, accounts for the large heat loss. In this connection, it is interesting to note that Mr. Brassert is installing a new type of gate valve, having a much smaller water-cooled surface in contact with the blast.

Table III

Detailed Results of Tests

TEST 3

Date	Nov. 10, 1913
Furnace	"G"
Product	Bessemer
Time furnace in blast before test	13 months
Time furnace in blast after test	13 months
Stove	No. 5
Aver. atmospheric temp.	51 deg. Fahr.
Average wind velocity, miles per hour	15.7
Precipitation	None
Average blast pressure	18.6 lb.
Average free air blown per minute, at 62 deg. Fahr. and 30 in. barometer	33,500 cu. ft.

PYROMETER READINGS

Time p. m.	Pyrometer *A* deg. Fahr.	Pyrometer *B* deg. Fahr.
3.20	1,610	1,450
3.22	1,610	1,440
3.24	1,590	1,440
3.26	1,590	1,435
3.28	1,565	1,430
3.30	1,555	1,425
3.32	1,545	1,420
3.34	1,530	1,410
3.36	1,530	1,410
3.38	1,520	1,405
3.40	1,510	1,400
3.42	1,490	1,395
3.44	1,485	1,385
3.46	1,580	1,380
3.48	1,470	1,375
3.50	1,470	1,370
3.52	1,460	1,365
3.54	1,450	1,365
3.56	1,440	1,360
3.58	1,440	1,355
4.00	1,435	1,350
4.02	1,425	1,350
0.04	1,420	1,345
4.06	1,400	1,340
4.08	1,400	1,335
4.10	1,395	1,330
4.12	1,395	1,325
4.14	1,390	1,320
Average	1,486	1,382

Total time stove on blast	54 min.
Direct average difference in temperature	104 deg. Fahr

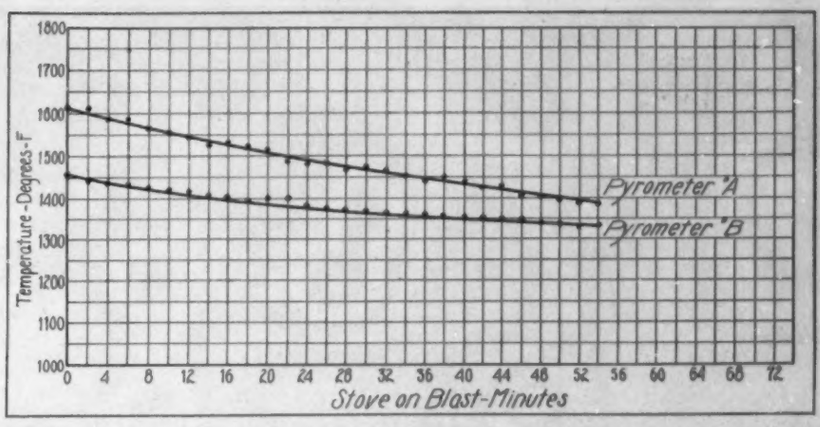


FIG. 4—TEST NO. 3—THE CURVES SHOW DIFFERENCE IN TEMPERATURE BETWEEN POINTS IN HOT-BLAST MAIN

The greatest heat loss in the hot-blast system occurs, of course, when the stove farthest from the furnace is on blast. However, when one of the nearer stoves is on blast, there must still be considerable radiation and conduction losses from the idle portions of the main and connections. It is not my purpose to discuss at length the radiation and conduction losses from hot-blast stoves. A good deal has been published on this subject and most blast furnace superintendents know about what losses are chargeable to this source.

We are now experimenting at Bethlehem with a special insulating brick for reducing heat losses from the blast main. Two straight sections of the main, each about 15 feet long, between hot-blast valve connections, have been lined with 4½ inches of special insulating brick, back of 4½ inches of fire brick, and have been in service for several months. Although an appreciably lower temperature of the shell on the outside of these sections was found than on other sections of the same main, the difference was not as great as had been calculated, doubtless by reason of the high thermal conductivity of the steel shell, with consequent rapid transmission between adjacent sections. It was not deemed wise to use these bricks in bends of the main, or in the short connections to hot-blast valves or stoves. Where there is a change of direction, fire brick are eroded more rapidly by the "sand-blast" action of dust in the hot-blast; and if the inner course of fire brick should be pierced, the soft insulating brick would be cut out with comparative rapidity. This doubtless would be the fate of any other ordinary insulating material similarly used.

Estimates have also been prepared for external insulation with 1½-inch pipe-covering blocks, a 1-inch air space being provided. Besides the possible objections to appearance, first cost, and maintenance, the question as to possible overheating of the shell, with consequent warping or unequal expansion, must be considered.

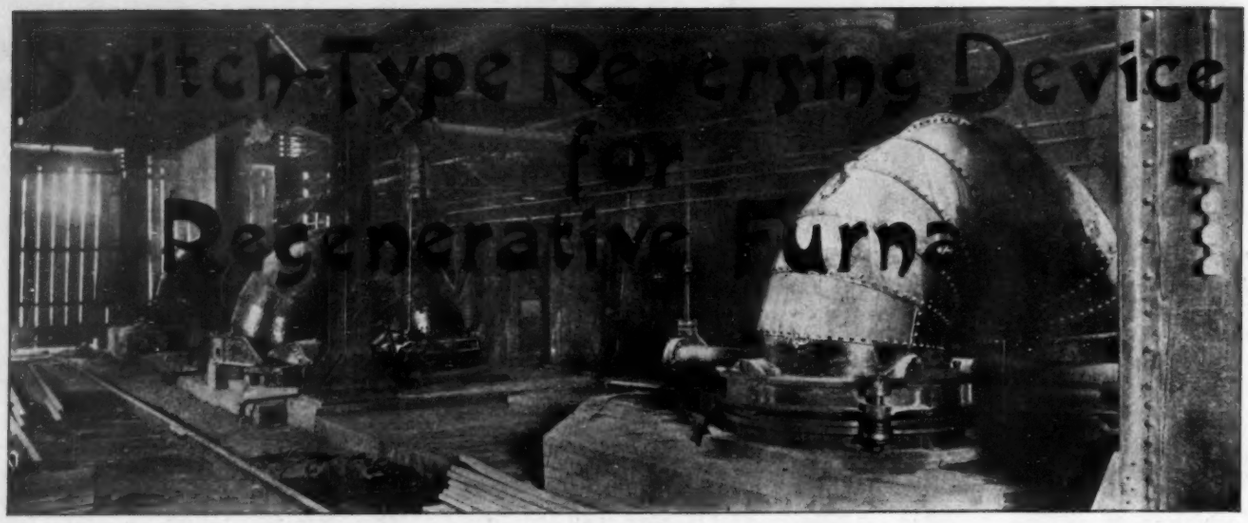
(*Continued on page* 443.)

Table IV

DIMENSIONS OF HOT BLAST MAIN.

	Inches.
Outside diameter of hot-blast main	48¼
Thickness of steel shell	⅜
Thickness of fire brick lining	9
	Feet
Length of hot blast main on center line from hot-blast valve, No. 5 stove, to bustle pipe	192
Length of bustle pipe on center line	115
Distance between pyrometers *A* and *B*	218
	Square feet.
Approximate total radiating surface corresponding to this distance	2,606
Approximate total radiating surface, five stoves	38,500
Approximate total radiating surface, five hot-blast valves and connections to stoves and main	1,286
Approximate total radiating surface, hot-blast main proper	2,373
Approximate total radiating surface, bustle pipe	1,474
Approximate total radiating surface, 10 leg pipes	370
Approximate total radiating surface, 10 blow pipes and tuyeres	110
Approximate total radiating surface between No. 5 stove and furnace	4,560
Approximate total radiating surface between No. 1 stove and furnace	2,965
Approximate total radiating surface between all stoves and furnaces	5,613

Switch-Type Reversing Device for Regenerative Furnace



SINCE the introduction of the regenerative furnace, which has developed into the modern open hearth furnace, few radical changes have been made in its design, beyond the increase in size of furnace, its adaptation to the basic process and the development of machinery for the rapid and economical handling of incoming raw materials and outgoing product to make possible the present large tonnages. An essential feature of the whole regenerative system is the reversing valve, which is required to operate within an atmosphere of hot gases, on one side directing the gas from the producers to the furnace and on the other side diverting the hot products of combustion to the stack. The problems involved have led to the development of numerous designs for reversing valves, based on the original idea of a self-contained structure having a valve within the gas box, as well as internal partition walls which form the flues and afford the only separating medium between the ingoing gas and the outgoing products of combustion.

Objections to Valve System

Fundamental weaknesses ascribed with this type of valve, include, it is argued, the liability of the valves to rapid deterioration on account of the extreme temperatures to which they are constantly subjected, as well as a resultant leakage loss, and the necessity of shutting down the entire furnace when it is desired to repair the valves. Another objection is based on the flow of gas from the producers to the stack, which takes place at each reversal of the furnace. In order to eliminate the objections attaching to the valve system, a method of reversing the direction of the gases in open hearth furnace flues, by means of brick-lined tubes acting on the principle of a railroad switch, has been developed by the Blair Engineering Co., New York. This method is now in use by the Brier Hill Steel Co., Youngstown, O., in its open hearth furnaces and soaking pits, and is being installed by the Inland Steel Co., Indiana Harbor, Ind., in its new open hearth plant, now under construction.

As illustrated in Figs. 1, 2 and 3, this device consists simply of a swinging section of flue, by which the flue to or from the furnace chambers may be made a continuous flue from the gas producers to the furnace at one

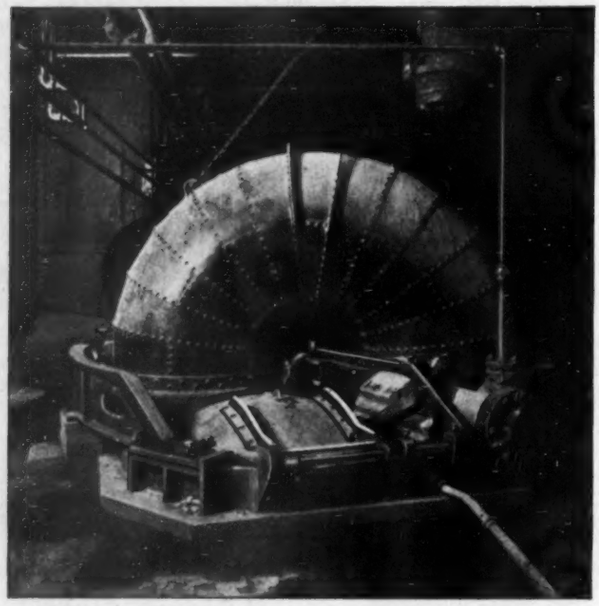


FIG. 1—INDIVIDUAL GAS VALVE, HYDRAULICALLY OPERATED

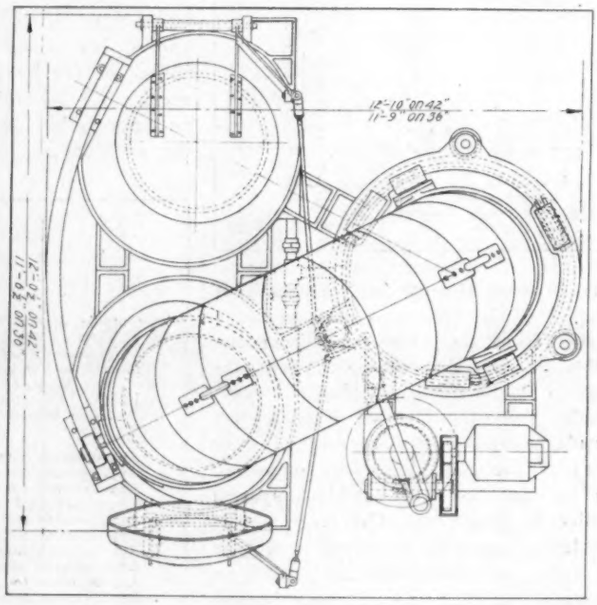


FIG. 2—INDIVIDUAL GAS VALVE, ELECTRIC DRIVE

end, and from the furnace to the stack at the opposite end, and by which the functions of these flues may be readily reversed without any valve.

Each flue is distinct, and completely separated from every other flue, there being no partition walls, so that no leak can occur between the gas and draft flues. As shown in Fig. 3, *A* and *A'* are regulating valves for controlling the supply of gas to the furnace. Adjacent are placed goose-neck tubes constructed of steel plate lined with firebrick, connecting the gas flue with the furnace at one end and connecting the opposite end of the furnace with the stack, through water-sealed connections at each end of the tubes. A heavy tube of similar construction to the goose-neck gas tubes connects the large air chamber on the outgoing end of the furnace with the stack. Steel plate covers are provided to regulate the supply of air to the furnace. Hydraulic cylinders reverse the mechanism as illustrated. This can also be accomplished by motors, as shown in Fig. 2. The method of reversing the tubes is shown in Fig. 3. The gas comes from the producers, in either overhead conduits or underground flues, to the regulating valves, *A* and *A'*.

In Fig. 3, *A* is open, admitting the gas to the furnace through goose-neck tubes. The air regulating cover is also open, admitting the required amount of air to the same end of the furnace. The products of combustion are passing out from the opposite end of the furnace, through suitable tubes, to the stack. To reverse the furnace, the gas regulating valve, *A*, is closed by means of a hydraulic cylinder, or motor, which, at the end of its stroke releases the valve actuating the cylinders or motors, which thereupon swing the three tubes over into the reverse position. The gas regulating valve *A'* is now opened by means of its hydraulic cylinder, or motor, and the furnace is reversed. In reversing the draft, the gas and air regulating valves are adjusted by automatic means to the same positions they occupied on the previous period of operation on their end of the furnace, so that the amounts of gas and air admitted are the same as they were when the furnace was previously reversed. When a repair becomes necessary the connecting tube is so placed as to become a part of the draft system operating from the outgoing end of the furnace.

If the repair is required on the gas tube, that part is disconnected, breaking the connection through that flue to the stack with the same effect as a damper in that flue. The draft then all passes through the air tube to the stack and the furnace continues in operation. If the repair should be required on the air flue connection, this flue is disconnected, and the draft passes through the gas tube to the stack.

Where waste heat boilers are used in connection with open hearth furnaces, a single tube, similar in construction to the regular reversing mechanism but having an area equal to the sum of the areas of the gas and air tubes, is provided by this system to divert the products of combustion to either the boiler or stack.

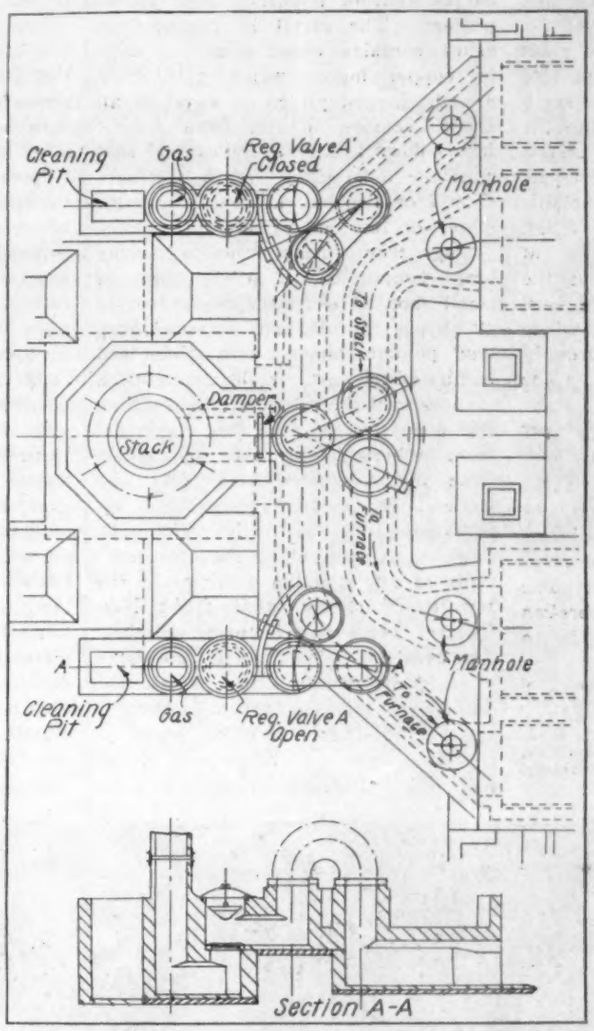


FIG. 3—PLAN SHOWING ONE OF SEVERAL ARRANGEMENTS OF FLUES

Book Review

Autogeneous Welding and Cutting; by Theodore Kautny, translated by the author and James F. Whiteford; 160 pages, bound in cloth; published by McGraw-Hill Book Co. and sold by *The Iron Trade Review* for $1 net.

The author of this workmanlike and thorough manual has been closely associated with the establishment of autogenous welding classes in technical high schools in various parts of Germany. His purpose has been to prepare a pocket book of brief compass for the engineer, the shop foreman and the practical welder. A conscientious effort has been made by both author and translator to avoid the use of confusing technical terms and the description of non-essentials.

Hammer Drills

The Chicago Pneumatic Tool Co., Chicago, is distributing a bulletin, describing its self-rotating type of hammer drills. These are made in three sizes and are suitable for drilling 6, 8 and 12-foot holes, respectively. Among the features of these drills is that of the rotation of the steel being entirely independent of the hammer piston, eliminating the use of ratchets or pawls. This is claimed to permit more rapid drilling, as the piston is free to deliver the full force of its blow upon the drill steel without losing a part of its power through the necessity of rotating the steel as well. Another feature is the valve, which consists of a standard hardened steel ball. It is ¾-inch in diameter and weighs a trifle more than an ounce. Its travel between its seats in the valve chest is only ⅛-inch.

The Piston Ring Co., Muskegon, Mich., is doubling the capacity of its plant by the erection of a new building. This company operates a gray iron foundry for the manufacture of piston rings.

The American Concrete Institute will hold its annual convention in Chicago, Feb. 14-17. John L. Godell, 1418 Walnut street, Philadelphia, is secretary.

Reclaiming Brass in a Ball Mill

THIS INTERESTING paper summarizes experiments on reclaiming brass from foundry ashes or slag and from floor sweepings, using a Hardinge conical ball mill fitted with chrome-steel lifting bars. Advantages claimed for this device are lower repair cost and continuous discharge of clean metal and sludge

BY ARTHUR F. TAGGART AND R. W. YOUNG

IN THE manufacture of brass and brass products the weight of the finished product leaving the plant is much less than the total weight of copper and zinc entering. A small part of this discrepancy is due to the unavoidable oxidation of the metals in melting, but by far the largest part of the loss is in the form of metallic particles of copper, zinc and brass. These losses occur principally at three points in the process: in the casting-shop ashes; in the slags from furnaces melting scrap brass; and in material spilled on the floor throughout the manufacturing process. The amount of these products in some casting plants is nearly 100 tons per 24 hours.

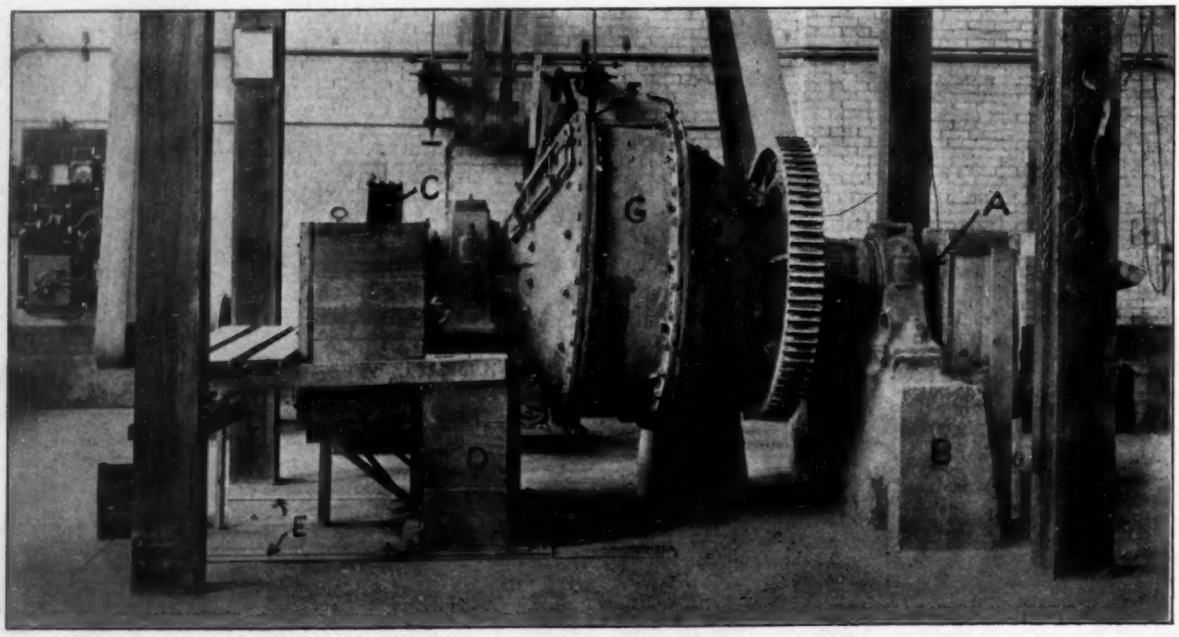
Casting-shop or brass foundry ashes contain the metal spilled from the crucibles during melting and pouring, and the metal included in the slags formed in the melting process. The ashes also contain pieces of broken crucibles with adhering metal; 20 to 30 per cent of unburned coal is also present. The metal in casting-shop ashes contains clean pieces of zinc or copper ingots weighing 1 to 2 pounds, jagged pieces of metal of all shapes ranging in size from several inches down to the finest dust, and shot and botryoidal shapes ranging in size from 2 or 3 inches down to 0.01 millimeter or less in diameter.

Slags from furnaces melting scrap brass contain metal in the form of small shot. Floor sweepings occur in all shapes; spirals, thin shavings, pins and pin-like pieces, wire, rods and buffing-wheel dust are the commonest.

In general the problem of reclaiming this metal has been to free the metal from adhering slag and separate it from the associated slag, coal and cinders. On its face this problem appears simple. That it is not simple, however, is attested by the concentrations of fine metallic particles in the sewers and stream beds of the New England brass-manufacturing districts. The usual plant installed has consisted of a crude hand-picking installation for recovering the coarse metal; a restricted-discharge grinder, such as the Huntington or Chilian mill, Krupp ball mill, Hill cinder crusher, etc., for severing the metal from the slag; a concentrating table, usually a Wilfley, for treating the fine discharge from the grinder; and a settling tank for the slimes flowing away from the concentrating table. The coarse metallics are collected intermittently by stopping the plant and cleaning out the grinding machine. These plants are claimed to throw away tailings assaying but 0.5 per cent copper. Such statements probably are based on erroneous samples, for the tailings will, when the plant is properly sampled, be found to contain up to 5 per cent copper, and most of the coal is frequently wasted.

In connection with the design of a plant for the treatment of brass ashes the writers were confronted with the problem of finding a grinder that would answer the following requirements: Take a feed containing particles of metal 2 or 3 inches in diameter, with adhering slag, and at the same time pieces of slag containing metal shot in all sizes from the above down to the finest; discharge continuously both the metallic and nonmetallic constituents of the feed, and thus eliminate the intermittent factor attendant upon the operation of the

A paper read at the New York meeting of the American Institute of Mining Engineers, Feb. 15, 1916. The authors, Arthur F. Taggart and R. W. Young, are connected with the Hammond mining and metallurgical laboratory, Sheffield Scientific School, Yale University, New Haven, Conn.



HARDINGE MILL FOR RECLAIMING BRASS WASTE

grinders previously mentioned; discharge a product of such character that all the material larger than 2.5 millimeters is clean metal, while all the slag and cinders are ground to pass the same screen; have a capacity of about 1 ton per hour; and have a reasonable repair and power charge. The following are the results of two tests run on a 4½-feet by 16-inch, conical ball mill with these requirements in mind.

Description of the Test

The mill used in these tests was a special one built by the Hardinge Conical Mill Co. for testing purposes and installed in the Hammond mining and metallurgical laboratory, Sheffield Scientific School, Yale University. As shown in the accompanying illustration, the mill is mounted with the discharge end, *A*, on a fixed foundation, *B*. The feed end, *C*, is carried on the wooden pier *D*, which can be slid parallel to the long axis of the mill and fastened in any desired position by holding-down bolts in the floor slots, *E*. The mill can be broken along the rims, *F*, and the cylinder, *G*, removed, thus giving a mill with no cylindrical section, or one, two or three cylinders can be inserted making the cylindrical portion of the mill 16, 32 and 48 inches long, respectively, as desired. The mill is lined with chrome-steel lifting bars. For the tests described herein, one 16-inch cylinder was used, making the mill the standard 4½ feet by 16 inches; the tilt was 2.5 inches toward the discharge end, the speed being 28 to 29 revolutions per minute. The ball charge was as follows:

Size of balls, inches.	Number of balls.	Weight, pounds.
5	100	1,927
4	100	951
3	205	815
1¼	1,002	720
Total		4,413

Details of Tests

Two runs were made, which are referred to as No. 1 and No. 2 in the accompanying tables. In run No. 1 the feed was sluice concentrate, containing 30.01 per cent coal; it was fed at a rate of 2.24 tons solid per hour. The moisture in the feed was 42.9 per cent and the power consumption was 20 horsepower. In run No. 2 the feed consisted of first and second gate discharges from jig, containing 1.23 per cent coal. It was fed at a rate of 0.91 tons solid per hour. The moisture in the feed was 39.7 per cent, and the power consumption was 21 horsepower. Sizing-sorting-assay tests of feed and product of the two runs are given in Tables I, II, III and IV. A concentrate can be made by sim-

Tests on Feed and Product

Table I.

SIZING-SORTING TEST ON FEED—RUN NO. 1.

—On screen— Aperture, Mm.	Wgt., grams.	Tons per 100 tons.	Cumulative per cent.	Assay, Cu, per cent.	——Tons per 100 tons—— Free metallic.	Slag.	Contained metallics.	Coal.	Per cent clean metallics in product on screen.
18.85	670.00	1.14	1.14	20.5	0.285	0.335	0.090	0.520	25.0
13.33	4,350.00	7.87	9.01	20.8	1.516	3.680	1.104	2.674	20.1
9.423	10,260.00	18.60	27.61	11.4	3.255	9.710	0.168	5.635	20.1
6.680	10,510.00	19.05	46.66	17.7	5.229	8.592	0.176	5.229	22.0
4.699	7,295.39	13.22	59.88	23.9	4.100	5.950	0.952	3.170	24.0
3.327	7,681.80	13.92	73.80	17.2	3.638	6.840	0.197	3.442	24.4
2.362	5,081.21	9.21	83.01	17.0	1.576	5.060	0.926	2.574	23.6
1.651	2,655.15	4.81	87.82	13.2	0.529	2.763	0.485	1.518	22.9
1.168	1,517.14	2.75	90.57	10.4	0.254	1.135	0.202	1.361	22.5
0.833	1,223.11	2.21	92.78	6.2	0.103	0.749	0.117	1.358	22.1
0.589	1,107.47	2.00	94.78	4.8	0.107	1.125	0.047	0.768	21.7
0.417	780.74	1.41	96.19	8.6	0.147	0.710	0.047	0.553	21.6
0.295	641.08	1.16	97.35	8.3	0.081	0.621	0.072	0.458	21.4
0.208	433.23	0.78	98.13	8.8	0.064	0.421	0.045	0.295	21.3
0.147	326.12	0.59	98.72	4.7	0.027	0.367	0.017	0.196	21.2
0.104	289.23	0.52	99.24	8.9	0.061	0.295	0.013	0.164	21.1
0.074	125.09	0.23	99.47	9.8	0.026	0.144	0.010	0.060	21.1
*0.074	292.95	0.53	100.00	10.6	0.085	0.354	0.005	0.091	21.1
†	80.29								
‡.....	55,320.00	100.00	.....	....	21.083	48.851	4.673	30.066	....

*Through. †Loss. ‡Totals.

Table II.

SIZING-SORTING TEST ON PRODUCT—RUN NO. 1.

—On screen— Aperture, Mm.	Wgt., grams.	Tons per 100 tons.	Cumulative per cent.	Assay, Cu, per cent.	——Tons per 100 tons—— Free metallic.	Slag.	Contained metallics.	Coal.	Per cent clean metallics in product on screen.
13.33	15.12	0.240	0.240	17.5	0.067	0.023	0.000	0.150	27.9
9.423	62.80	0.995	1.235	44.6	0.692	0.060	0.018	0.243	61.4
6.680	211.78	3.360	4.595	44.9	2.306	0.449	0.104	0.605	66.7
4.699	326.68	5.180	9.755	48.3	3.942	0.539	0.061	0.699	71.6
3.327	401.79	6.368	16.143	42.6	4.038	1.036	0.298	1.294	68.4
2.362	436.05	6.912	23.055	41.2	2.829	2.232	0.400	1.851	60.2
1.651	425.68	6.752	29.807	25.7	1.437	3.672	1.335	1.643	51.4
1.168	441.61	7.003	36.810	12.5	0.662	2.956	0.733	3.384	43.4
0.833	498.17	7.900	44.710	10.5	0.313	5.083	1.008	2.504	36.4
0.589	550.18	8.725	53.435	8.1	0.488	4.923	0.637	3.314	31.4
0.417	563.52	8.939	62.374	8.0	0.635	4.780	0.503	3.524	27.9
0.295	481.63	7.641	70.015	6.6	0.342	4.396	0.471	2.903	23.4
0.208	385.10	6.105	76.120	7.3	0.154	3.772	0.559	2.180	23.5
0.147	362.65	5.754	81.874	6.8	0.091	3.796	0.535	1.867	22.0
0.104	328.29	5.207	87.081	6.5	0.078	3.571	0.467	1.558	20.7
0.074	98.28	1.560	88.641	6.7	0.008	1.374	0.159	0.178	20.4
*0.074	715.80	11.359	100.000	9.3	0.011	8.829	1.672	2.519	18.1
†	104.88								
‡.....	6,410.00	100.000	.....	....	18.093	51.491	8.960	30.416	....

*Through. †Loss. ‡Totals.

Table III.

SIZING-SORTING TEST ON FEED—RUN NO. 2.

—On screen— Aperture, Mm.	Wgt., grams.	Tons per 100 tons.	Cumulative per cent.	Assay, Cu, per cent.	——Tons per 100 tons—— Free metallic.	Slag.	Contained metallics.	Coal.	Per cent clean metallics in product on screen.
26.67	323.00	7.810	7.810	55.9	6.285	1.525	0.698	.....	80.5
18.85	363.00	8.775	16.585	29.2	1.524	7.251	2.588	.....	47.1
13.33	1,065.00	25.757	42.342	25.8	6.045	19.591	5.425	0.121	32.7
9.423	1,088.00	26.307	68.649	31.6	8.340	17.846	4.970	0.121	32.6
6.680	720.00	17.420	86.069	36.1	7.257	9.800	2.808	0.363	34.2
4.699	380.00	9.189	95.258	42.9	5.200	3.747	1.115	0.242	34.6
3.327	91.33	2.210	97.468	43.5	1.219	0.896	0.320	0.095	36.8
2.362	28.16	0.681	98.149	43.9	0.380	0.267	0.098	0.034	36.2
1.651	19.91	0.482	98.631	37.6	0.221	0.246	0.069	0.015	37.0
1.168	9.90	0.239	98.870	32.7	0.098	0.125	0.026	0.016	37.0
0.833	6.27	0.152	99.022	25.7	0.033	0.102	0.030	0.017	37.0
0.589	6.00	0.145	99.167	21.4	0.025	0.096	0.024	0.024	37.0
0.417	4.58	0.111	99.278	17.1	0.018	0.068	0.013	0.025	36.9
0.295	4.86	0.118	99.396	15.3	0.015	0.077	0.013	0.026	36.9
0.208	4.63	0.112	99.508	10.7	0.001	0.084	0.018	0.027	36.8
0.147	4.73	0.114	99.622	10.5	0.002	0.079	0.018	0.033	36.8
0.104	5.00	0.121	99.743	7.4	0.001	0.084	0.014	0.036	36.8
0.074	2.73	0.066	99.809	9.1	0.001	0.051	0.008	0.014	36.7
*0.074	7.91	0.191	100.000	13.1	0.010	0.161	0.029	0.020	36.7
‡.....	4,135.01	100.000	.....	....	36.675	62.096	18.324	1.229	....

*Through. ‡Totals.

ply screening the discharge from the mill. The grade of this concentrate will depend on the character of the feed to the mill and the aperture of the screen used. Since brass containing more than 10 per cent dirt (slag and coal) is unsuitable for remelting, the concentrate obtained by screening the product from run No. 1 is not sufficiently clean. The product from run No. 2 can be screened on a 1.651 millimeter screen and will give a concentrate containing 90.9 per cent clean metal. If cleaner metal is desired, it can be obtained by using a screen of larger aperture.

The material passing the 1.651 millimeter screen in run No. 2 containing 13.9 per cent metal is too rich to be thrown away, as is done in some plants, or to be sold to a junk dealer at a couple of dollars a load, as is done in some others. In run No. 2 about 25 per cent of the total feed to the mill, containing 70 per cent of the total metallic in the feed, can be saved clean enough for remelting without the use of concentrating machines.

A comparison of the sizing tests on feed and product of runs Nos. 1 and 2 shows that finer grinding was done in run No. 2. This is due partly to the lower rate of feed and partly to the large percentage of coal in the feed in run No. 1. It will be noted in Table II that more than 50 per cent of the non-metallic material remaining on the 2.362-millimeter screen is coal. A comparison of results shows that the coal does not grind as freely as the slag.

Analysis of the data given shows that the metallics have been reduced in size from 6.08 millimeters to 3.62 millimeters, average size in run No. 1, and from 11.83 millimeters to 3.01 millimeters, average size, in run No. 2. The reduction is not, however, so great as indicated, by reason of the fact that the largest pieces of metal were held back in the mill, the duration of the runs not being great enough for them to work through. The writers believe that the sharp increase in the percentage of minus 0.074-millimeter metallics in run No. 2 is due, not to sliming, but to the freeing of the included metallic from the slag, as was not done in run No. 1. This belief was borne out by an elutriation test, Table V, which showed no metallic in the finest sizes, and was confirmed by microscopic examination of the minus 0.074-millimeter material, which revealed the majority of the free metallics to be rounded, and not jagged, as would be expected had they been abraded from the larger pieces.

The tables show the reduction in size of the slag in the two runs and the necessity of this reduction in order to free the metal. Microscopic examination of a slag particle, 0.1 millimeter in diameter revealed the presence of metal shot not more than 0.01 millimeter in diameter. In order to free these shot for concentration the greatest possible reduction of the slag is essential.

The reduction in size of coal is not so great in run No. 1 as in run No. 2. In both cases, however, the bulk of the coal will pass a 1-millimeter screen, and is, therefore, too fine for burning economically without special appliances. Its value to the plant is much less than if it were removed from the ashes before grinding.

Conclusions

The 4½-foot by 16-inch conical ball mill, operated as described in run No. 2, if fed a dirty brass concentrate containing slag and a little coal, at the rate of one ton per hour, will grind the slag coal or coke so that a great part of it will pass a 1.651-millimeter screen while the brass in the feed will be only slightly reduced in size and can be separated from the dirt by screening. The screening operation can be performed by attaching a trommel of the proper aperture to the discharge end of the mill.

If the feed to the mill contains a considerable percentage of coal, the product saved on the screen will contain more than 10 per cent dirt. The writers believe that this will be true even if the feed rate is considerably below one ton per hour.

As compared with the other types of machine at present being used for

Tests on Feed and Product

(Continued)

Table IV.

SIZING-SORTING TEST ON PRODUCT—RUN NO. 2.

—On screen— Aperture, Mm.	Wgt., grams.	Tons per 100 tons.	Cumulative per cent.	Assay, Cu, per cent.	——Tons per 100 tons—— Free metallic.	Slag.	Contained metallics.	Coal.	Per cent clean metallics in product on screen.
9.423	79.00	1.316	1.316	62.5	1.316	0.000	0.000	0.000	100.0
6.680	233.00	3.881	5.197	61.8	3.827	0.054	0.014	0.000	99.0
4.699	374.00	6.229	11.426	61.3	6.075	0.138	0.040	0.016	98.3
3.327	308.50	5.138	16.564	56.4	4.382	0.703	0.248	0.053	94.3
2.362	328.50	5.475	22.039	57.7	4.850	0.592	0.205	0.033	92.9
1.651	248.00	4.131	26.170	53.1	3.310	0.686	0.197	0.135	90.9
1.168	183.90	3.063	29.233	45.8	2.080	0.875	0.168	0.108	88.4
0.833	175.90	2.930	32.163	36.3	1.399	1.387	0.302	0.144	84.7
0.589	243.90	4.066	36.229	20.2	0.960	2.721	0.352	0.385	77.8
0.417	308.00	5.132	41.361	12.5	0.553	3.837	0.477	0.742	69.5
0.295	428.10	7.135	48.496	9.3	0.215	6.024	0.841	0.896	59.7
0.208	432.80	7.211	55.707	8.6	0.213	5.880	0.784	1.118	52.4
0.147	460.80	7.680	63.387	10.7	0.233	6.338	1.085	1.109	46.1
0.104	507.00	8.446	71.833	9.9	0.183	7.222	1.163	1.041	41.4
0.074	299.30	4.987	76.820	11.5	0.161	4.262	0.756	0.564	38.5
*0.074	1,393.20	23.180	100.000	11.5	4.265	17.067	.....	1.848	34.0
†	206.10								
‡.....	6,210.00	100.000	.....	....	34.022	57.786	6.632	8.192	....

*Through. †Loss. ‡Totals.

Results of Elutriation Test

Table V.

ELUTRIATION TEST ON MINUS 0.074 MILLIMETER MATERIAL, PRODUCT OF RUN NO. 2.

Current Mm. per sec.	Weight, grams.	Tons per 100 tons original product.	Per cent.	Cumulative per cent.	Assay Cu, per cent.	Tons per 100 tons of original product. Metallic.	Slag.	Coal.
9.5	0.45	0.241	1.09	1.09	51.1	0.197	0.044	0.000
5.1	2.80	1.499	6.80	7.89	23.5	0.563	0.936	0.000
4.2	1.67	0.896	4.06	11.95	9.0	0.130	0.766	0.000
3.2	4.25	2.273	10.32	22.27	12.1	0.440	1.833	0.000
2.3	3.65	1.955	8.87	31.14	10.0	0.313	1.617	0.025
1.5	3.87	2.071	9.39	40.53	9.6	0.317	1.547	0.207
0.9	4.99	2.672	12.13	52.66	9.8	0.419	1.932	0.321
0.6*	9.09	4.869	22.09	74.75	9.9	0.771	3.528	0.570
A	10.12	5.435	24.67	99.42	10.4	0.905	3.929	0.601
B	0.24	0.128	0.58	100.00	0.0	0.000	0.095	0.033
Totals	41.13	22.039	100.00	.....	....	4.055	16.227	1.757

*The discharge from the elutriation apparatus with 0.6 millimeter per second current was led into the bottom of a 2-liter wide-mouth bottle. A siphon dipping about 1 inch into the neck of this bottle carried the fine slime to other bottles rigged up in the same way. After standing several hours the supernatant liquid in these bottles was decanted and evaporated to dryness giving the product marked *B*; the material which settled in all but the first bottle is marked *A*. The material which settled in the first bottle is that opposite the 0.6 millimeter per second current.

grinding brass ashes, the conical ball mill should show a decreased repair cost, since screens are eliminated, and it has a further advantage in that it discharges continuously not only the ground slag and coal or coke, but also the cleaned metal. The metal is not slimed in the mill, but that which is not caught clean on the screen is of such size that it can be easily saved by proper table treatment. While the basis for the conclusion does not appear from these tests, the writers have found in other work along similar lines that with the mill horizontal the metal is not cleaned up and the large pieces of metal will not discharge.

Heat Loss in Hot Blast Mains

(*Continued from Page* 437.)

In the construction of a new hot-blast main, the logical plan apparently would be to design it of sufficient diameter to permit lining with 9 inches of fire brick and a backing of several inches of insulating material.

Conclusions

First.—Between the stoves and the blast furnace, there is a very marked drop in the temperature of the hot-blast, which is not only serious as to temperature but signifies also a thermal loss. It is affected by many variables, such as size and length of hot-blast mains and connections, thickness of fire brick linings, volume and initial temperature of air passing per unit of time, temperature and wind velocity of the outside air, extent of water cooling, etc. It is probable that, at a great many furnace plants in the country, these losses are of sufficient magnitude to justify an attempt at their reduction. The present tendency is toward higher blast heats on furnaces carrying large percentages of Mesabi ores in their mixtures; and high heats have always been desirable in smelting hard, coarse ores, such as magnetites so generally used in the east. In the manufacture of spiegel and ferro-manganese, the maintenance of high blast temperatures is of particular importance. This is particularly important in all plants where economy in the use of blast furnace gas must be practiced, owing to its large consumption in gas engines or under boilers.

Second.—Insufficient insulation in the hot-blast main is the cause of serious temperature and heat losses. It seems logical and practicable to prevent a large percentage of these losses by means of one of the methods of insulation suggested in this paper. With such insulation, other operating conditions being normal, we would expect higher available blast heats with resulting fuel economy, or a smaller quantity of fuel gas necessary for heating the stoves. I believe that blast-furnace managers and superintendents generally will be interested in a study of better insulation of the hot-blast main and stoves.

Opportunities in Italy

Charles F. Hauss, president of the American Chamber of Commerce of Milan, Italy, who has been in this country for the past several months is returning by the NEW AMSTERDAM, sailing Feb. 26, after having made arrangements with American manufacturers of pig iron and foundry supplies to act as their representative in Italy. Mr. Hauss expresses the opinion that there is a large market for American raw materials and machinery of all kinds in Italy which the manufacturers should take pains to develop in a substantial way at this time. Heretofore the supplies of Italian manufacturers and foundries came largely from Germany, Austria and England. In 1913, Germany sold in Italy $1,000,000 more of pig iron than either England or the United States. Mr. Hausse is a native of Cincinnati. He formerly represented the American Radiator Co. abroad and had traveled throughout Europe in the interest of that company for the past 14 years. His address at Milan is 16 Via Alberto da Guissano.

Missouri Ships Tungsten

The first consignment of tungsten ore concentrates produced in the state of Missouri, was forwarded a few days ago to the Crucible Steel Co. of America, Pittsburgh, by F. P. Wherry, Maplewood, Mo. Analysis of these concentrates gave 90 per cent hubnerite, or 70 per cent tungstic acid. It is stated that only 3.3 pounds of mine ore was required to produce each pound of the concentrate. Shipments, it is said, will soon be forwarded from a manganese property in the same state, also controlled by Mr. Wherry. Ore from this property is claimed to meet the requirements of the dry battery, plate glass and brick industries.

Expansion Plan Troubles

The directors of the Winchester Repeating Arms Co., New Haven, Conn., told the stockholders at the annual meeting Feb. 9 that, while 1915 earnings had been very gratifying, it was deemed advisable to leave these earnings in the business and to raise $8,250,000 additional to carry out the expansion of the plant. An issue of stock to refund the bonds was authorized. Thomas G. Bennett was elected president and treasurer pro tem because of the fact that President Winchester Bennett is out of the country recovering from typhoid pneumonia.

The annual statement of the Scovill Mfg. Co., Waterbury, Conn., submitted at the annual meeting Feb. 8 showed that the company had increased its net earnings more than 1,000 per cent since 1914. The net earnings for the year were $5,974,362.29 as compared with $456,994.99 in 1914. The surplus was $8,138,207.79 as compared with $3,063,845.50 in 1914. During the year the company expended $2,336,244.66 for land, buildings, machinery and additions.

Pressed Steel Car Report

One of the most remarkable years in the history of the car-building industry of this country was represented by the 12 months of 1915, according to F. N. Hoffstot, president of the Pressed Steel Car Co., who describes and explains these conditions in his annual report to the stockholders, submitted today. Mr. Hoffstot tells how, after six months of the lowest rate of business in history, the market expanded sharply, especially during the last quarter, only again to be checked by the unwillingness of the railroads to pay the present high prices for steel. He said:

"We began the year with less business on our books or in sight than any year in the history of the company and booked less domestic business during the first half of the year than any similar period. In the fourth quarter of the year a strong buying of cars began, which very soon slowed down, the principal reason for this being the advance in the price of raw materials, which largely increased the production cost. This increased cost was so great that the railroads doubtless felt that the additional revenue from their larger volume of business alone was not sufficient to warrant buying equipment at the new prices. Their failure to receive substantial rate advances, sorely needed to offset other increased costs, presumably was the controlling factor in preventing such purchases.

Louis Kruger, master mechanic for the Hygienic Mfg. Co., Chicago, has become president of the Ultra Mfg. Co., Chicago.

Pig Iron Men Meet in Cleveland

E. N. Hurley, Vice Chairman, Federal Trade Commission, Talks on Co-operation at Annual Meeting of American Pig Iron Association

THE tremendous activity of American iron and steel foundries, as well as that of independent steel producers, is reflected in the unfilled tonnage on the books of the great majority of the merchant blast furnaces of the United States. At the annual meeting of the American Pig Iron Association, held at the Union Club, Cleveland, Friday, Feb. 18, it was reported that the unfilled tonnage of its members on Dec. 31, 1915, showed an increase of nearly 1,500,000 tons, as compared with the orders on their books at the close of 1914. The total unfilled contracts at the close of last year aggregated 2,559,587 tons as against 1,178,484 tons, Dec. 31, 1914.

The stocks on hand also showed a decline of more than 150,000 tons, from 653,033 tons Dec. 31, 1914, to 449,192 tons, Dec. 31, 1915. The membership of this organization includes the producers of the bulk of the merchant furnace tonnage of the United States and represents blast furnace manufacturers without direct steel plant or foundry connections for the outlet of their product.

Another gratifying feature of this meeting was the announcement made by E. N. Hurley, vice chairman of the federal trade commission, who delivered the banquet address Friday evening. He stated that at the present time the commission is suffering from a lack of adequate information regarding industry and that detailed data nowhere are available which will enable its members to pass upon underlying difficulties intelligently. Therefore, to co-operate with the manufacturers and merchants of the country to the fullest extent, the federal trade commission is going to ask business men, during the next few weeks, to answer a few simple questions pertaining to their industries, which will be compiled for their benefit and sent to them. This information will embrace facts regarding the products which they manufacture, such as annual sales, capital invested, depreciation, etc. This information will be compiled by industries and the summary of results will be sent to each company engaged in that particular line of manufacture. This will give every man in that particular line of trade an opportunity to know whether or not the industry in which he is engaged is in a healthy condition. If an industry with large capital is showing no earning power, that industry either is not well managed or the production exceeds the demand. Knowledge of existing conditions will prevent others from entering the business or unprofitably investing additional capital where overproduction already exists. The industry where conditions are unsatisfactory will receive particular attention and the real causes of the conditions will be ascertained. Mr. Hurley added that these facts are not to be asked for in any inquisitorial spirit and he believed that the hearty co-operation which the federal trade commission thus far has received from the business men of the country indicates their appreciation of the need of such definite facts.

A Spirit of Co-operation

Mr. Hurley's address was enthusiastically received and his grasp of the needs of American business, which he viewed from the standpoint of the business man of experience and not that of the politician, made a favorable impression. The following, taken from Mr. Hurley's address, is indicative of the spirit of co-operation toward business prevailing among the members of the federal trade commission:

"All of us are talking a great deal these days about mobilizing American resources. Mobilizing means simply effective organizing to achieve a common purpose. The American Pig Iron Association is an instrument for mobilizing industry. Associations such as these exist for this very purpose. They constitute a most potent influence for improving the conditions under which business is done. They are the outward expression of the spirit of co-operation and of self-help, and it is in that spirit that all of us must approach the task of bettering business conditions.

"The demand for better things is typical of our American spirit. It is found in Cleveland; it is present in Washington. It lies at the heart of the activities of this association; it is the basis of the work of the federal trade commission.

"The whole tone of the business world has improved under criticism. Business men have become more skilled in meeting the problems of competition by lawful means. Today business is anxious to do right. It wants to obey the law, and lately the business man has been coming down to Washington with specific cases seeking light.

"In analyzing the data for the larger and more successful corporations of the country, a striking fact developed which I am sure will be of particular interest to you. It brings out a broad and basic fact which cannot fail to impress thinking men. In tabulating the data for these large and successful corporations in the United States, comprising all the corporations doing a business of $100,000 a year or over, we found that out of a total of 66,000, 30,000 charged off no depreciation whatever. To be sure, some of them may have included this in other items, but the large majority appear clearly to have made no allowance whatever for depreciation. Does this not demonstrate the need of a most thorough study of our industries as a basis for remedying these conditions? Does it not also show the necessity for better accounting methods and business practice?

"Whole industries, in many instances, are suffering from a general lack of intelligent knowledge of cost. How can the federal trade commission help to improve conditions?

"The commission has no intention and no desire to use compulsory methods. But it does hope to reach the desired end by encouraging improvements in accounting practice, by endorsing standard systems of bookkeeping and cost accounting, and by assisting in devising standard systems, either at the request of individual merchants and manufacturers or through the association that represents the industry. The commission expects to have for this work an adequate force of experienced accountants and cost experts, and already has the services, in an advisory capacity, of public accountants of national reputation.

"There is no doubt but that the business of the country requires some readjustment in a helpful way. Many suggestions have been made by writers and lawyers of note, by captains of industry and legislators, prescribing different remedies. There is no

one remedy that will give relief to all our ills. What will help one industry may injure or kill another. But I believe that there are a few fundamental principles upon which may be based the diagnosis and treatment of ailments of industry and commerce. If the patient does not become nervous and lose confidence in his doctor, he will be able to do as much for himself as is done for him by others.

Trade Organizations are Powerful

"With all that has been accomplished in this direction by collective effort, however, we have made only a beginning. In Germany every important industry is organized into trade associations, and 85 per cent of the manufacturers engaged in those industries are represented in their respective trade organizations.

"Germany's success as a commercial and industrial world power is due very largely to the policy of organizing and co-operating, of the working together of its captains of industry, of establishing communities of interest between the small and the big business men for the mutual purpose of promoting trade at home and abroad. The old adage "In unity there is strength" is put into practice, and has proved to be the backbone of Germany's industrial and commercial achievements, efficiency and strength.

"More than 600 independent associations of manufacturers, producers and merchants exist in Germany today, and besides the entire industrial system of that country is honeycombed with about 5,000 subsidiary business organizations.

"There is no question more interesting to ponder at this time, in considering the betterment of business conditions, than that of foreign trade. It is a most important question to our country. Our mines and forests, and our factories are turning out products for which there is demand abroad, and it is not merely a question of increasing this demand, but the question of creating conditions that will enable us to get good prices for our wares, and produce them at the lowest possible cost, that should particularly command our attention.

"We are confronted with the fact that when we buy abroad we are at the mercy of the foreign seller, and when we sell abroad we are at the mercy of the foreign buyer. And the reason is that the European industries are organized scientifically to capture foreign trade and to get all there is out of it, while we in America have suffered the consequences of this more or less one-sided organization. Our method of disposing of our natural products, containing our valuable raw materials, and constituting the chief wealth of our country, should be stopped by the adoption of some practical, reasonable business method. For every dollar's worth of *additional* wealth that we receive for these products the people of the United States profit, and when we do not receive a fair price for the products that we ship abroad we are impoverishing our people, and our country is that much poorer.

"In European countries manufacturers and merchants, aided by their governments, have developed a high state of efficiency, which enables them to sell their goods in the markets of the world. Our buyers, seeking raw and finished materials in foreign countries, who formerly had a free competitive field from which to receive goods, now find that the great manufacturing industries have been formed into combinations or cartels; and, instead of receiving goods from several concerns, the American buyers now have to do business with central selling agencies, each representing a whole industry. But when the foreign buyer seeks material here he finds our unsystematized market—much to his own satisfaction.

"If the American manufacturer and merchant is forced to purchase his materials abroad at a higher price because of the elimination of the old competitive system, is it fair that our business men engaged in the foreign trade should be subjected to the ruinous features of the old system here at home?

A Violation of Trust

"Right here, I want to emphasize the fact that the owners of our vast natural resources are the trustees of the American people. When they sell their products at ridiculously low prices, the lumber, the copper and coal that comes from Nature's storehouses—they are violating their trust for the ruinous trade spells a waste that brings nothing in exchange.

"We do not export much coal but we sell a great deal to foreign ship owners to bunker their vessels in our ports. At Newport News some of the finest coal in the world goes into foreign bunkers, and the price is set for a year ahead by a combination of English brokers. In the face of rising labor costs, because certain operators were induced to make low bids, the price this year was forced down 20 cents a ton. With freight and other charges deducted the net price at the mine are 6 or 7 cents per ton lower than our domestic price. And this advantage will be handed to foreign ship owners on nearly 2,000,000 tons of West Virginia coal this year.

"At Frankfort-on-the-Main, Germany, there is a combination—a family affair—which in normal times controls the world's market for copper and other metals. Time and again it has depressed the price of our lake copper, despite the fact that this country produces two-thirds of the world's supply of that metal. The trick is performed by dealing with *our producers* as *individuals*, and playing one against the other.

The Future at Stake

"Several years ago the German potash miners were competing between themselves and selling potash to foreign countries at a ridiculously low price. Finally they formed a cartel to regulate these prices, and were encouraged by the German government. After this cartel had been in existence for several years a difference of opinion developed and several members withdrew and started negotiations with American buyers for the sale of their potash. One of the largest opened up negotiations with Armour & Co., of Chicago, and a contract was made with this firm below the cartel prices. After the contract was sealed, signed and delivered, the German government notified the independent potash producers that they would have to break the contract; that the prices quoted to Armour & Co. were too low; that while the individuals were the owners of the mine they were in reality the trustees for the German people, and that the selling of potash to American packers at the price quoted affected every man, woman and child in Germany; that when the potash was gone one of the most valuable resources for Germany's future was destroyed. That is the way Germany does with one of her natural resources.

"There should be a great degree of organization and of mutual helpfulness in all lines of trade and industry, so that American business may be welded into a commercial and industrial whole; the part of the government being to co-operate with business men, on request, to bring about the results that will benefit business and hence promote our national welfare.

"The war has brought to us great opportunities, and equally great dangers. The thought that we must keep in mind is, "After the war, what?" Shall we grow and expand

while the growing is good, or calmly await the time when peace in Europe will be followed immediately by keen competition not only in foreign markets, but in our domestic market as well?

"Have we taken an adequate inventory of our business resources? Are these resources being developed to the best advantage? Are our associations doing all they can? Are we diligent in standardizing our methods and processes? In short, are we mobilizing our industries?

"Let us seek better organization and greater efficiency at home; let us push our trade abroad; let us develop our industry so strongly that no foreign competition can dislodge it. Industrial preparedness must be our watchword."

J. G. Butler Jr., of Youngstown, O., president of the American Pig Iron Association, presided, and other speakers included Bascom Little, president of the Cleveland chamber of commerce; W. H. Cottingham, president of the Sherwin-Williams Co., Cleveland; James H. Hoyt and Andrew Squire, Cleveland, and Frank B. Baird, president of the Buffalo chamber of commerce.

Officers for the ensuing year were re-elected as follows: J. G. Butler Jr., Youngstown, O., president; F. B. Richards, M. A. Hanna & Co., Cleveland, treasurer, and John A. Penton, Cleveland, Secretary.

Display Cement Products

Ninth Annual Cement Show, Chicago, Closes Doors After Successful Week

Chicago, Feb. 22.—The ninth annual cement show closed Saturday after a week of exhibition in the Coliseum and the First Regiment armory. The progress of the industry and the added uses of cement, discovered during the past year, as well as new appliances for its preparation and application, were interestingly displayed by a large number of manufacturers. The steelmaker is vitally interested in the increased use of cement, his product being extensively employed in the construction of concrete work. With steel as the backbone and bonding tie, concrete gains immensely in strength and durability and is uses are much broadened by the association. Steelmakers have a further interest in the cement business, owing to the increasing use of steel products in the manufacture of appliances for handling cement and concrete. Mixers, block machines, hoisting towers and distributing devices and a hundred other appliances of iron or of steel are consuming an ever increasing tonnage. As the market situation has outlined itself for the present year, steelmakers are not interested to the usual degree in the hunt for business, the market having run away from all control and demand for all sorts of steel, including reinforcing material, being far ahead of the supply. In fact, there promises to be some shortage of this material, which may be severe enough, as the months pass, to restrict building in some degree.

Makers of reinforcing material were well represented at the show and worked with the cement manufacturer in the educational campaign to enlarge the application of this material. A feature of the exhibition was the attention paid to concrete road building, which has been coming more and more into prominence in the recent past. A number of exhibits of methods of building highways of reinforced concrete, as well as new appliances designed for the economical mixing and application of road material, were shown. Steel wire companies are putting forth woven wire mesh for use as reinforcement. This is more easily laid than small bars, and, as it comes already woven, requires no labor to tie the material at the several crossings. This is a development of the reinforcement business. As the mesh resembles woven wire fence, it may be manufactured by plants ordinarily engaged in the manufacture of the latter.

Business this spring according to cement men, is opened in a way to promise a large volume for the coming summer. Some industrial concerns who delayed adding to their facilities last year are forced this year to make the contemplated enlargements in order to meet demands on them and are preparing to build at once.

While contracts for steel wire cannot be placed with the larger steel producers for delivery during the present year, most of the makers being sold up until the beginning of 1917, jobbers have large stocks. They are protected in large degree by contracts with mills and will have a large tonnage to supply to the trade. Makers of hard steel bars rerolled from rails have kept their books clear of long-time contracts, and are in a position to sell material as fast as it is demanded.

With jobbers and hard steel makers ready to care for immediate needs, and makers of special deformed bars also well embarked on their regular contracts, the shortage promises to be smaller than has been imagined.

A feature of this year's cement show was the series of exhibits in the First Regiment armory. This building was given over to the manufacturers of Portland cement. They united to present an educational exhibit without pressing their separate claims. Their exhibits were not distinguished by firm names and the entire armory was filled with a wide variety of products to illustrate the uses of cement and concrete, with a view to broadening its uses. In this exhibit the makers of reinforcing material also participated. Steel is the companion of cement in construction work and its manufacture appropriately joined hands in the educational campaign.

Among the exhibitors were the following: American Steel & Wire Co.; Archer Iron Works, Chicago; Atlas Engineering Co., Milwaukee; Austin Western Road Machinery Co., Chicago; Blaw Steel Construction Co., Pittsburgh; Blystone Mfg. Co., Cambridge Springs, Pa.; Brownwall Engine & Pulley Co., Holland, Mich.; Calumet Steel Co., Chicago; Carnegie Steel Co., Pittsburgh; Chain Belt Co., Milwaukee; Conneaut Shovel Co., Conneaut, O.; Hydraulic Pressed Steel Form Co., Cleveland; Ideal Engine Co., Lansing, Mich.; Illinois Steel Co., Chicago; Jaeger Machine Co., Columbus; Northwestern Steel & Iron Works, Eau Claire, Wis.; Oshkosh Mfg. Co., Oshkosh, Wis.; Trussed Concrete Steel Co., Youngstown; Universal Concrete Bar Co., Chicago.

Entertains Officials.—The Newport Rolling Mill Co., Newport, Ky., recently entertained 50 of the officials and executives of the company at a banquet followed by a theater party. Extemporaneous speeches were made by several of the officials.

The American Railway Engineering Association will hold its annual meeting in Chicago, March 21 to 23. At the same time the National Railway Appliances Association will hold its exhibit at the Coliseum, Chicago, and other organizations of similar nature will hold conventions.

Many Scientific Papers Presented

Two Iron and Steel Sessions at Annual Meeting of American Institute of Mining Engineers—Discussions Are Interesting

THE annual meeting of the American Institute of Mining Engineers, held in the Engineering Societies' building, New York, Feb. 14-17, was notable for the presentation of a number of papers embodying the results of painstaking research into the scientific fundamentals of the metallurgy of iron and steel. Among the several papers of this character may be mentioned, "Magnetic Studies of Mechanical Deformation in Certain Ferro-magnetic Metals and Alloys," by H. Hanemann and P. D. Merica; "Vacuum Fused Iron with Special Reference to the Effect of Silicon," by T. D. Yensen; "The Recrystallization of Cold-Worked Alpha Brass on Annealing," by C. H. Mathewson and Arthur Phillips; "Metallography of Steel for U. S. Naval Ordnance," by H. E. Cook; "Effect of Carbon on the Physical Properties of Heat Treated Carbon Steel," by J. H. Nead; "The Control of Chill in Cast Iron," by G. M. Thrasher, and "Suggestions Regarding the Determination of the Properties of Steel," by A. N. Mitinsky. In addition, a large number of papers containing many suggestions of direct practical application were presented. Two sessions were devoted entirely to ferrous metals and the committee on iron and steel, of which Prof. Joseph W. Richards, Lehigh University, South Bethlehem, Pa., is chairman, displayed unusual energy and ability in assembling the great variety of papers presented at the New York meeting.

The meeting opened at 10 a. m. Monday, Feb. 14, with a technical session on petroleum and gas, followed by simultaneous afternoon sessions on coal and coke and geology. Among the papers of interest to the iron and steel industry presented at these sessions were the following: "Illuminating of Mines," by Ropert P. Burrows; "The Effect of Aeration and 'Watering-Out' on the Sulphur Content of Coke," by J. R. Campbell; "The Iron Deposits of Daiquiri, Cuba," by Waldemar Lindgren and Clyde P. Ross, and "The Iron Ores of the Philippine Islands," by Wallace E. Pratt. The latter paper will be published in one of the forthcoming issues of *The Iron Trade Review.*

In his paper entitled "The Effect of Aeration and Watering Out," J. R. Campbell, chief chemist, H. C. Frick Coke Co., Scottdale, Pa., states that in the by-product oven, which is essentially a true distallation process, the sulphur is distilled from the pyrite as atomic sulphur, afterward, apparently, combining with the hydrogen of the coal gas to form hydrogen sulphide. It is necessary to remove this very objectionable constituent from the gas before it can be used for domestic purposes. This is accomplished by the use of hydrated oxide of iron. Here again, the author states, appears the fallacy of superaerating bee-hive oven coke to eliminate sulphur, for in by-product ovens, in which no air is admitted, there is just as much desulphurization of the coke as in the bee-hive process; in fact, there is more when the matter of increased yield is considered. The author also states that the desulphurization of coke by water cannot be complete. The prime object of the use of water is to lower the temperature of the coke and not desulphurization. The quenching process should be regarded in this light.

An exceedingly interesting paper entitled "Grinding Brass Ashes in the Conical Ball Mill" was presented at the Tuesday morning session by Arthur F. Taggart and R. W. Young, of Sheffield Scientific School, Yale University, New Haven, Conn. This paper, which is published in full elsewhere in this issue of *The Iron Trade Review,* deals with a new method of recovering brass refuse that is of particular value at this time on account of the high prices of copper and spelter.

Papers on Conservation

At the Tuesday afternoon session three papers of interest to the iron and steel industry were presented, including "An Electro-Hydraulic Shovel" by Frank H. Armstrong, published in full in *The Iron Trade Review,* Feb. 17, and two papers on conservation by Prof. R. T. Ely and C. K. Leith of the University of Wisconsin. These papers deal respectively with conservation and economic theory, and with the conservation of iron ores. Dr. Leith ventures the opinion that the reserves of iron ores in the two Americas are so enormously in excess of the requirements of the present generation that no shortage is to be anticipated for many generations in the future. Dr. Leith also points out that a large part of the value of iron ores is put into them by man's efforts to make them available, and this fact, he thinks, makes it practically unnecessary for the present generation to make any especial sacrifice for future generations in the way of conservation of its almost unlimited iron ore resources. The first session on iron and steel, 10 a. m. Wednesday, Feb. 16, was opened by the presentation of a paper entitled "Measurement of the Temperature Drop in Blast-Furnace Hot Blast Mains" by R. J. Wysor, chief chemist, Bethlehem Steel Co., Bethlehem, Pa. This paper, which deals with an effort to control the heat losses from hot-blast mains, is published in full elsewhere in this issue.

In answer to a question propounded during the discussion, the author pointed out that the heat flowed through the steel shell of the main, from the uninsulated portions to the insulated section, and this militated against obtaining results that were entirely satisfactory. The pyrometers, said the author, were standardized by comparison with the melting point of aluminum. Prof. Joseph W. Richards pointed out that the black stack paint with which the hot blast system was protected undoubtedly increased the radiation losses; the use of white or aluminum paint was suggested instead of the customary black. Professor Richards stated that in his opinion it would pay well in heat saved to keep all furnace shells, stoves, blast-mains, etc., painted white. Another speaker, discussing this paper, pointed out the difficulty of obtaining accurate temperature results, due to radiation from the dust particles in the gas which tend to give a high reading with a thermo-couple pyrometer.

"The Metallography of Steel for U. S. Naval Ordnance" by H. E. Cook, published in *The Iron Trade Review* Feb. 17, was read by title in the absence of the author. The discussion was opened by Prof. Albert Sauveur, Harvard University, who stated that he agreed with Mr. Cook in regard to the possibility of improvement in methods of heat treating steel castings. Castings, said Prof. Sauveur, can never be made as good as forgings, but considerable progress may be expected. Professor Sauveur also pointed out that very little is accomplished by annealing steel castings above the AC1 point, inasmuch as the coarse ferrite would remain unchanged. Later in the day, the author stated that the specifications criticized by Prof. Sauveur referred to gun forgings and not to castings. Professor Sauveur thanked the author for pointing out his error, but replied that the annealing of forgings above the AC1 point is equally undesirable. Continuing the discusion, the author said

that the specifications for castings, which require a temperature of 1,500 degrees, are not entirely satisfactory. In reply to a question, the author stated that small gun forgings have recently been made successfully out of chrome-vanadium steel, the results being entirely satisfactory as compared with nickel steel. There are objections, however, to Mr. Cook's opinion, to the use of chrome-vanadium steel for large forgings, such as 14-inch gun barrels which weigh about 18 tons.

Ingots Heavily Cropped

In a further discussion of Mr. Cook's paper, Prof. Richards called attention to the excessive crop demanded in the specifications, namely 30 per cent from the top of the ingot and 5 per cent from the bottom. The question of safely reducing this crop is vital in a consideration of the economics of steel manufacture. The author stated that the 5 per cent crop is required from the bottom of any open-mold ingot, and that it makes no difference whether the ingot is cast large or small end up. Mr. Cook said that less discard is permitted only on fluid compressed ingots. Professor Richards pointed out that some of the difficulty lies in the presence of finely divided, suspended oxides or slag in the steel. In some cases, he said, a final refinement in the electric furnace would be in order to remove these impurities.

W. McA. Johnson, Hartford, Conn., presented a paper in which he attempted to show why graphite particles are round in oxygenated cast iron. According to Mr. Johnson this phenomenon is founded on the fact that the particles of any precipitate are made denser and harder by the presence of a reagent having a solvent action on the precipitate.

"The Control of Chill in Cast Iron" by G. M. Thrasher, chief chemist, Haskell & Barker Car Co., Michigan City, Ind., which was published in *The Iron Trade Review* Dec. 16, 1915, was presented by Dr. Richard Moldenke in the absence of the author. In opening the discussion, Dr. Moldenke said that in Europe the sulphur in malleable castings runs as high as 0.40 per cent, although there is no manganese present to take care of it. The practical foundryman, said Dr. Moldenke, is held to narrower limits than the theory expounded in Mr. Thrasher's paper would indicate, on account of the difficulty of controlling temperatures in the ladle, etc. Prof. Sauveur stated that he believed the author overlooked some recent developments when he stated that sulphur has very little influence on the formation of chill. There is some sulphur, said Prof. Sauveur, present with the cementite, which opposes the transformation of combined carbon into graphite, thus having a direct bearing on the question of chill.

As previously suggested, an unusually interesting paper covering "Magnetic Studies of Mechanical Deformation in Certain Ferromagnetic Metals and Alloys" was presented by H. Hanemann and P. D. Merica, assistant physicist, Bureau of Standards, Washington, D. C.

Simultaneous magnetic and mechanical measurements were made in a tensile-testing machine on soft iron and other materials. These were made with a view to determining whether relations existed between the physical and the magnetic constants of such materials. It was found that the permeability of iron is independent of the previous elastic history of the material if (1) the alternations or cycles of stress have been within the elastic limit, and (2) the number of alternations has been small. It was found that there is a close and nearly linear relation between the elastic limit of soft iron and the values of the stress at which the permeability maxima occur, as the material is elongated. The magnetic indications and accompanying features of mechanical overstrain were studied. The conclusion is reached that the magnetic method is applicable to the study of the previous mechanical history of such annealed iron as was investigated, since indications are thus given of the values of the maximum stress to which it has been subjected, provided that this stress has been above the elastic limit. The permeability of this material is not affected by stress applications under the elastic limit. The effect of initial stresses upon the form of the induction-stress curves was noticed in the case of material as received, before annealing, and as heat treated by quenching in water.

Dr. Richards pointed out that some of the conclusions embodied in this paper are revolutionary and stated that in his opinion it would have a far-reaching effect on certain manufacturing processes. Another speaker asked the author if the change in permeability resulting from stressing nickel steel, pointed out in the paper, was due to a reversion to alpha iron. Dr. Merica replied that the effect of the deformation was apparently the same as that of drastic cooling.

In opening the discussion of Mr. J. H. Nead's paper on the "Effect of Carbon on the Physical Properties of Heat Treated Carbon Steel," Prof. Albert Sauveur stated that steel in the pearlitic condition reaches its maximum strength at the eutectoid point. Text book statements, he said, to the effect that steel reaches a maximum strength with 1 per cent carbon, are incorrect, insofar as this holds good only with steel in the sorbitic condition. Professor Sauveur also presented a formula for computing the tensile strength of steel from the carbon content. This formula, which has been recently revised, is as follows:

$$TS = 45{,}000 + 84{,}000\,C$$

where C equals the carbon content in per cent and TS, the tensile strength.

This formula is based on a tensile strength of 45,000 pounds per square inch for ferrite and 115,000 pounds for pearlite. The previous values for these two constituents were 50,000 pounds and 125,000 pounds, respectively.

Another speaker stated that the Brinell hardness numbers given in Mr. Mead's paper showed improper annealing, indicating that the steel may have been slightly sorbitic. Another speaker outlined the work of the bureau of standards in making up some pure iron carbon alloys similar to those utilized by Mr. Nead in his experiments. These alloys will be made-up with great care, permitting the study of the behavior of steel with certain disturbing elements entirely eliminated. A written discussion of Mr. Nead's paper was presented by Prof. E. D. Campbell, University of Michigan, Ann Arbor, Mich.

Combustion of Furnace Gas

The Wednesday afternoon session on iron and steel was opened by the presentation of a paper on "Modern Developments in the Combustion of Blast Furnace Gas, with Special Reference to the Bradshaw Gas Burner" by K. Huessener, president Huessener Engineering Co., Pittsburgh. The conclusion of this paper is as follows:

Boiler efficiencies depend on both efficient burners and good boiler "morals." If either of the two is lacking, high efficiency will generally be impossible. Boiler "morals" include proper conditions in the boiler plant itself, as well as intelligent working and close supervision. The regulation of a boiler plant should be done, as far as possible, exclusively on the dampers. With otherwise perfect conditions, efficiencies depend on the boiler loads. With a boiler load of 100 per cent an efficiency of 80 per cent is possible. With higher loads, it will soon drop to 75 per cent, but as a rule there will be no need to decrease the efficiency any further. Gas washing is profitable for stoves, but almost always results in losses where it is done for boilers. Moisture in the gas does not seriously affect efficiencies, except in the case of entrained moisture, which should be avoided. Where gas washing is resorted to, the most favorable temperature from the viewpoint of efficiency is 100 degrees Fahr. It is advisable regularly to draw up carbon balance sheets and keep a check of the results obtained by reducing them to pounds of steam per pound of coke.

Vacuum Fused Iron

An exceedingly interesting scientific paper on "Vacuum Fused Iron with Special Reference to the Effect of Silicon" was presented by T. D. Yensen, assistant research professor of electrical engineering, University of Illinois. Dr. Yensen's conclusions are in part as follows:

"By means of the vacuum method of melting it is possible to obtain a decidedly purer product than has thus far been obtained in any other manner.

Consequently by the use of this method more definite conclusions, than have hitherto been possible, can be drawn with regard to the effect of silicon upon iron.

"Silicon, like boron, has a double effect upon iron. Part of it combines with the iron and remains in solid solution throughout the cooling of the alloy, while a smaller part reduces the iron oxide present. The tensile strength of the vacuum product follows in general the same law as alloys made under ordinary conditions, but the ductility of the former is much greater, particularly below 2 per cent and above 3 per cent, probably due to the absence of carbon. The maximum tensile strength of 105,000 pounds per square inch occurs with a silicon content of 4.5 per cent. The limit of forgeability lies between 7 and 8 per cent silicon. A critical range occurs between 2.50 and 2.60 per cent, in which the alloys are exceedingly brittle —in some cases being not even forgeable. The chemical composition of the latter corresponds to a compound of the formula $Fe_{19}Si$.

"With regard to the magnetic properties, the vacuum alloys exhibit most remarkable characteristics. The best alloys are obtained with about 0.15 per cent and 3.40 per cent silicon after annealing at 1,100 degrees Cent.. The maximum permeability for both of these alloys is above 50,000, and the hysteresis loss for maximum fluxes of 10,000 and 15,000 is about 300 and 1,000 ergs per cubic centimeter per cycle respectively. This hysteresis loss is one-eighth and one-third of the corresponding loss for commercial silicon steel. The most favorable annealing temperature is in every case, 1,100 degres Cent.

"The specific electrical resistance increases about 13 microhms for the first per cent silicon added. For each additional per cent added the increase is about 11 microhms. Consequently th 3.40 per cent alloy has a resistance nearly five times that of the 0.15 per cent alloy."

Silica Brick for Coke Ovens

Considerable discussion was generated by a paper on "Manufacture and Tests of Silica Coke Oven Brick" by Kenneth Seaver, chief engineer, Harbison-Walker Refractories Co., Pittsburgh. This paper was presented originally at the San Francisco meeting of the American Institute of Mining Engineers in September, 1915. At that meeting Prof. Joseph W. Richards presented a statement to the effect that the coke ovens at South Bethlehem failed on account of the use of improper brick. The manufacturer of the brick in question entered a formal denial, which was read into the record at the New York meeting. It was also pointed out that the South Bethlehem ovens probably would have proved satisfactory if they had been operated according to German rather than American methods; the latter involve the use of high heats and short coking periods, making the employment of silica brick imperative.

To further stimulate the discussion, Prof. Richards presented two specimens of failed coke oven brick. In one case, the brick itself had fused, although the mortar was not melted. This brick was made of fire clay. The other brick did not fuse, although the mortar melted and ran out. This was a silica brick. Professor Richards also presented a curve showing the fusibility of silica-alumina mixtures. This curve indicated that the use of an incorrect mortar in contact with silica brick might form a self-fluxing compound which would reduce the fusing point to 1,600 degrees. For this reason Prof. Richards recommended the use of a low alumina mortar for silica brick. Another speaker pointed out that in zinc works the difficulty is due to spalling rather than to the fusing of the brick. This speaker was of the opinion that a good fire-clay brick can be made to resist a temperature of 1,700 degrees and that such a brick is practically as good as a silica brick with silica mortar.

W. H. Blauvelt, consulting engineer, Semet-Solvay Co., Syracuse, N. Y., pointed out, however, that the selection of suitable refractories for coke ovens does not depend simply on the resistance of the brick to high temperature. The brick must be able to withstand heavy loads while it is heated to the fusing point. For this reason, said Mr. Blauvelt, silica brick is employed inasmuch as it stays hard at high temperatures, whereas a plain fire-clay brick will become plastic at temperatures considerably below its actual melting point. The general construction of coke ovens must also be considered, and the problem of expansion and contraction must be dealt with. Silica brick, said Mr. Blauvelt, expands when hot, tending to keep the oven tight. He also stated that mortar tests should invariably be made with the brick, as nearly under actual service conditions as possible. The mortar also should be as close to the composition of the brick as possible, and only slightly more fusible. Modern American coke oven construction and operating practices make exceedingly severe demands on refractories, and in the opinion of Mr. Blauvelt, brick manufacturers should be complimented on the success they have achieved in meeting this difficult problem.

In discussing Mr. A. N. Mitinsky's paper on the "Determination of the Properties of Steel", Prof. Sauveur pointed out that the author's remarks lead back to a general discussion of the elastic limit and that the location of the elastic limit depends on the accuracy or delicacy of the instruments used for determining the point of permanent set. Therefore the author's statement that steel will not fail under an alternating load unless stressed beyond the elastic limit may be correct.

William Kent, consulting engineer, New York, author of *Kent's Mechanical Engineers' Pocket Book*, advocated the employment of Johnson's arbitrary definition of elastic limit, namely, the stress per square inch at the point where the elongation per unit length is 50 per cent in excess of the minimum elongation.

A bar under test, said Dr. Kent, may not stretch uniformly, and therefore the value of the stress representing the limit of proportionality may vary at different points on the bar. Leonard Waldo, consulting engineer, New York, commented on Dr. Kent's remarks, pointing out that steels with similar elastic limits do not necessarily show the same resistance to fatigue.

Among other papers presented at the two iron and steel sessions on Wednesday were the following: "Manganese Steel Castings in the Mining Industry" by W. S. McKee, vice president, American Manganese Steel Co., Chicago, published in *The Iron Trade Review* Dec. 2, 1915; "Washed Metal" by Henry D. Hibbard, consulting engineer, Plainfield, N. J.; "Iron Ores of California' by C. C. Jones, published in *The Iron Trade Review*, Dec. 30, 1915; "The Duplex Process of Steel Manufacture at the Maryland Steel Works" by F. F. Lines, published in *The Iron Trade Review* April 1, 1915; "The Electric Furnace in the Foundry" by William G. Kranz, National Malleable Castings Co., Sharon, Pa., and the "Commercial Production of Sound Homogeneous Steel Ingots and Blooms" by E. Gathmann, published in *The Iron Trade Review*, Aug. 12, 1915.

New York Air Brake Report

Increased equipment business during the closing months, added to the partial completion of orders for munitions, enabled the New York Air Brake Co. to present a favorable report for the year ended Dec. 31, 1915. It is announced the dividends are to be increased from 6 to 8 per cent. The company earned in 1915 $743,000 over its dividends of $600,000. Total sales of the year were $4,731,529, an increase of $1,815,597. President C. A. Starbuck, reviewing the year, says:

"Until October the equipment business for the last year was one of the worst on record. October and November witnessed a most remarkable change for the better, so that December sales and deliveries were in excess of the first nine months of the year's business, and the largest handled for any month in the company's history.

Welfare Work on Cuyuna Range

Influence of Chas. A. Stillman Shown at the Kennedy Mine—

Interesting Facts About the Ore Bodies

THE Kennedy mine has the distinction of being the first mine operated in the Cuyuna iron ore district. The property originally embraced the fractional SW¼ of Section 29, the NW¼-SE¼, the N½-SE¼-SE¼ and the fractional NE¼ of the SE¼ of Section 30, 47-28, Crow Wing county, Minn., a total of about 250 acres, but a part of the property in each section has been surrendered and only about 100 acres remain.

The lessors now are William Harrison and George H. Crosby, of Duluth, and the Orelands Mining Co. The lessee is the Rogers-Brown Ore Co., of Chicago, and the local superintendent of the operations is George A. Anderson.

Most of the surface buildings are made of white cement brick with red tile roofing. The grounds and buildings are kept neat and clean, flower boxes adorn windows and gardens the grounds. Welfare work is indulged in extensively, and is said to be producing good results among the employes. The mine also has a rescue crew and a first-aid crew. Charles A. Stillman, the president of the company, is a strong advocate of welfare work and is responsible for these introductions. This company easily ranks first in the district in this respect, as the grounds about the mine bear witness.

Shaft sinking was started in 1908, at a time when all material had to be transported five or six miles by horse and wagon. The first wooden drop-shaft had to penetrate 123 feet of clay and sand saturated with water. Sinking was slow and the shaft suffered severely before it reached the rock. No other shaft sunk since then in the district had such difficulty or progressed so slowly. After a little drifting was completed, a second shaft was sunk, about 100 feet away. This shaft is of lath; it progressed rapidly, principally because the water was drained downward in shaft-sinking through a three-inch drill casing made up of three-foot sections previously driven from the top of the surface through the rock formation into the drift underneath. As sinking proceeded, these three-foot sections were progressively removed. This second shaft is now the operating shaft, the other serving merely for ventilation. At a considerable distance from these two shafts, is a small one used for lowering timber.

There are four lenses of ore on this property. They are somewhat irregular in shape, but parallel in strike and partly overlapping, and are located in a great width of iron-bearing formation which represents a southeastward dipping limb of a plunging fold pitching northeastward. This structural feature it is important to recognize, because Rabbit Lake covers the northerly part of the property and some of the ore bodies extend under the lake. This deposit presents many interesting geological features as to structure.

The four lenses are termed the north, the midway, the intermediate, and the south lenses. This relationship was not recognized when the property was first opened because of the lack of systematic preliminary explorations. Four different parties at different times had previously drilled many holes on the tract and each drilled without system, the lack of which greatly hampered underground work, and probably will for some time. Now that the geological structure is fairly well understood, additional exp'orations can be conducted wisely.

Grade of Ore

The ore is both red and brown in color, is non-bessemer in grade, and is of granular structure. Some parts of the mine contain considerable ore analyzing over 60 per cent in iron (dried); other parts contain ore with much disintegrated, powdery chert. In the attempt to mine clean, a 55 per cent ore (dried) is graded. The ores have the advantage of containing less than 10 per cent moisture, sometimes as low as 7 per cent. Silica ranges about 11 per cent. All other constituents are very low. This ore has been repeatedly spoken of as being a good furnace ore.

Shipments

At the close of this season a grand total of a little over 1,000,000 tons has been shipped. The annual shipments lately amounted to 200,000 tons, which can easily be doubled. The ores have been used by the numerous companies in which the Rogers-Brown Ore Co. is interested. The mine is served by both the Northern Pacific and the "Soo" railways.

The principal level is at 262 feet. The main sub-level is at 170 feet on the north lens and 150 feet on the intermediate lens. The south lens has been mined down to the main level, and the midway lens nearly so. The workings are very extensive, and both north and intermediate lenses have been mined almost down to their respective sub-levels. The slice-and-cave system of mining is used, and electric haulage is employed on the main level and on the stock pile trestle.

Equipment

The operating shaft measures 10 x 14 feet, has five compartments, and is equipped with a steel headframe resting on concrete piers. A long wooden stock pile trestle is erected annually and 100,000 tons stored.

Water for the boilers is taken from a separate compartment at the bottom of the shaft. One 75 and one 125-gallon pump do this work. The main pump is a duplex, condensing, two-stage Prescott with 28 and 36-inch stroke, and with a 2,000-gallon capacity. The two emergency pumps are of 1,200 and 1,500-gallon capacity, the one a duplex Prescott and the other a Terry steam-turbine pump. The mine does not deliver quite 2,000 gallons in spite of its extensive openings, nor its proximity to Rabbit lake, which has no effect on the quantity of water in the mine.

In the engine room are two hoists, one a 14 x 18-inch Sullivan duplex, the other a 12 x 16-inch National. There is a Sullivan air compressor, a compound condensing Corliss tandem engine, a 75-kilowatt, 115-volt 65-ampere generator-unit for surface lighting, and a 250-volt, 200-ampere Allis-Chalmers generator-unit to operate the haulage system and the machines in the shop.

The addition of $500,000 in cumulative preferred stock to the capital of the Henry Vogt Machine Co., Louisville, gives that company a capital of $1,000,000. The increase is by way of preparation for extended business and does not forecast immediate extension of the plant. The amendment to the charter was signed by Henry Vogt, G. A. Heuser and A. V. Heuser as owners of more than two-thirds of the capital stock.

Business News of Nation's Capital

Proposed Tax on Pig Iron and Fabricated Steel is Not Favored in House—Safety First Exhibit in National Museum Shows Reduction in Accidents

INDICATIONS point strongly to the improbability of congress placing a tax on pig iron and fabricated steel as one method of raising the revenue which will be necessary to the proposed preparedness program of the administration. The proposal of President Wilson in his address to congress last December to assess a tax of 25c per ton on pig iron and fabricated steel, along with similar suggestions he made, does not meet with the approval of the democrats of the house, as was shown by the attitude they took last Thursday night in caucus. No less an authority than Majority Leader Claude Kitchin told *The Iron Trade Review* that he did not think pig iron and fabricated steel would be taxed.

"I am not in favor of that sort of taxation," said Mr. Kitchin, "and do not believe it will be favored either by the ways and means committee or the house. I think if the President wants to enact a preparedness program, resort should be had to the income tax law, along with a tax on war munitions."

Asked what his understanding of war munitions was and on which taxes might be assessed, he said he had reference to those articles which are used directly in warfare, such as guns and their parts, and powder. He said it would not be his idea to place a tax upon material in the raw or semi-finished state out of which is to be produced war material. For instance, he said, he would not be in favor of taxing steel bars and other such products which may be made into war material.

Mr. Kitchen, as is known, is opposed to the President's preparedness program, but apparently appreciates that sentiment is in favor of it and that revenue to enact it will have to be raised. It is confidently believed that the administration will readily yield to the opposition expressed against the taxing of pig iron and fabricated steel and other articles the President specified in his message.

Mr. Kitchin is also opposed to creating a tariff commission as is proposed by the President and to a revision of the tariff, but evidences indicate that a tariff commission of some kind will be created, perhaps generally along the lines of the Rainey bill, considered to be an administration measure. Mr. Kitchin said the ways and means committee had not yet taken up that bill, and he was unable to say what action on it may be taken, but intimated that work on it will be begun in the not distant future. It is the general opinion that the committee will act favorably upon legislation looking to the prevention of the dumping of foreign goods upon the American market, and Mr. Kitchin approves of this form of legislation. The bill recommended by Secretary of Commerce Redfield to prevent dumping appears to stand a good chance of being reported out favorably.

Hill Urges Protection

Mr. Hill made a vigorous speech in the house last week in favor of the measure he has introduced and it made an impression on members. He pointed out that both consumers and producers of dyestuffs are desirous of seeing that the industry is protected; set forth the pressing need of building it up at once through protection; said the proposed anti-dumping legislation was inadequate and with a mass of facts and figures showed that this country could build up as great an industry of that kind as any nation. He explained, also, that it would mean much in the way of national defense because of the explosives that could be produced, the same base being used for both dyestuffs and explosives. The waste from coke ovens of the United States was referred to as being most deplorable, and it was urged that the situation be remedied.

Replying to statements which have been distributed among members of congress that the United States is producing one-half of the dyestuffs it requires, Mr. Hill said:

Dyestuff Output Overestimated

"Such statements are going about all the time. It was for that reason that I submitted an absolute inventory of the product of American mills today. I was told somewhat authoritatively that the United States Steel Corporation was going to go into the manufacture of intermediates and dyes, and a telegram was at once sent to them and the reply was that they did not even contemplate making either crudes, intermediates or dyes. We were making about 3,000 tons a year when the war broke out. The profit on what has been made since has been put into the extension of plants, and we are now making 6,500 tons, while we have a consumption of 30,000 tons. That means famine."

The bill introduced by Mr. Hill is based upon the report and recommendation of the American Chemical Society, composed of 10,000 chemists. Its conclusions were as follows:

A. To prevent the unfair underselling alleged to be practiced by foreigners in this country, the adoption of an effective anti-dumping clause.

B. The so-called coal-tar "intermediates," which are the basis of the coal-tar chemical industry, inclusive of explosives, medicinals, and dyestuffs, should be assessed one-half of whatever the finished dyes are taxed for tariff purposes; all coal-tar dyes, without exception, to be taxed alike, namely, 30 per cent ad valorem and 7½ cents per pound specific.

C. Changes in the patent laws, such as by compulsory licensing or compulsory working clauses are wholly ineffective, do more harm than good, and should not be attempted.

Tillman in Earnest

Washington, Feb. 22.—Senator Tillman, chairman of the committee on naval affairs, insists that he was in earnest last week when he introduced an amendment to the administration government owned armor plate bill authorizing the secretary of the navy to seize a private armor plant or plants, to be held so long as "the public interests may require." Senator Tillman's plain purpose is to have the government take over one or more private plants to make its own armor plate necessary to the proposed five-year naval program. He said that to do so would prevent the government from being compelled to pay higher prices for armor than heretofore, and would nullify the alleged threat of armor makers that they would charge the government $200 more hereafter for armor if the government entered into the manufacture of armor plate. The Tillman amendment provides for the taking over of a private plant or plants "for the purpose of manufacturing armor plate for such warships as are now building, or are now authorized, or which may be authorized, before the government is ready to manufacture armor plate in its own plant, and thereafter to return the possession of said land, buildings and machinery, to be held by said former owners as their own property as if the taking hereby authorized had not been made". Mr. Tillman said that the taking of the property, in times of peace is justified by the fifth amendment to the constitution which gives the government the right to take pri-

vate property for public uses provided compensation is paid the owners. The Tillman amendment provides that armour makers would be compensated through bringing suit in the court of claims of the United States.

National Safety Exhibit

Government Bureaus Show Surprising Results of Safety First Movement in Iron and Steel Industries

Washington, Feb. 22.—The striking results of safety activity in the iron and steel industry and in the manufacture of heavy machinery are set forth in a series of 12 charts prepared by Lucian W. Chaney, of the bureau of labor statistics, department of labor, which are being exhibited in a great national safety first exposition in the National museum, Washington. The exposition opened Monday morning and will last over Saturday of the present week. It is the most comprehensive exposition of the kind ever held, and shows by motion pictures, lectures, charts and apparatus means of providing safety on land and sea, in the workshops of the nation, in the homes of the people, in the mines underneath the ground, and the vessels on the lakes, rivers and high seas. The exposition is held under the auspices of the 25 federal bureaus, the American Red Cross and the District police department. The bureaus exhibiting are arranged by groups, under their respective departments, and a special day has been set aside for members of congress. In the afternoons and evenings there are continuous motion pictures and steropticon lectures. The extent to which the federal government is engaged in human conservation work is depicted for the visitor in a vivid manner, and offers many revelations. It is asserted by officials at the exhibit that there is no other agency in the world that is doing so much work for the safety and welfare of humanity as the federal government.

Safety First Statistics Shown

Dr. Chaney explained to *The Iron Trade Review* details of the charts relating to the safety first movement in the iron and steel and machinery industries, taking each in its numerical order. Most of the figures he presented are new and have not been published heretofore. One chart shows the accident frequency in a large steel plant from 1900 to 1913, inclusive. It shows a decline from 370 accidents per 1,000 employes in the former year to 115 in the latter year. The decrease was slow between 1900 and 1905, the number of accidents being reduced from 370 in 1900 to 300 in 1905. After the safety first movement was organized the decrease, having been from 300 in 1905 to 115 in 1913, was rapid.

Conditions in a steel plant with an excellent safety organization are contrasted with those in a steel plant with a poor safety organization in graphic form, showing the number of accidents per 1,000 employes for 1910.

Additional charts illustrate the relation between frequency and severity rates of accidents, the frequency rates being based on each 1,000 employes, while the severity rates represent the number of days lost each year per employe. In the past accidents hazards have been measured by means of frequency, but government statisticians claim that the real test is represented by the amount of loss of working time. In working out the severity rates each injury is weighed according to its severity. The scale used is similar to the one provided for in a representative compensation act.

Nature of Accidents

Other charts show causes and nature of accidents in a large steel plant, one chart contrasting the years 1905 and 1913, and illustrating how the different causes of injury have changed. The more interesting figures, showing the number of accidents per 1,000 employes, follow:

Causes.	1905.	1913.
Falling and flying objects.....	93	25
Hot metal	27	12
Cranes and hoists.....	19	12

Another chart contrasts the causes of accidents in the iron and steel and machine building industries for a period of years. In the iron and steel industry 27 per cent of all the accidents and 23 per cent of the lost time were due to falling and flying objects. In the machine building industry 24 per cent of all the accidents and 23 per cent of the lost time were due to the same cause, the percentage of lost time being identical in both industries. In the iron and steel industry 9 per cent of the accidents and 13 per cent of the lost time were due to cranes and hoists, as compared with 8 and 18 per cent, respectively, in the machine building industry; in the iron and steel industry 59 per cent of the accidents and 4 per cent of the lost time were due to operations of machines, as compared with 18.9 and 19.2 per cent, respectively, in the machine building industry; in the iron and steel industry 9 per cent of the accidents and 11 per cent of the lost time were due to hot metal, as compared with 2 and 4 per cent, respectively, in the machine building industry.

By a chart is shown the accident hazard of non-English speaking workers. Both as to severity and frequency the rate is higher in this group for all the periods represented. In 1906 and 1907 the English speaking workers experienced frequency of accidents at a rate of 140 per 1,000 employes, as compared with 230 for non-English speaking workers. The English speaking severity rate was 15.3 days lost time per worker each year as compared with 15.04 days for the non-English speaking employe. For the period 1906-1913, the English speaking workers had a frequency rate of 94, as compared with 210 for non-English speaking employes, while the severity rate was 8.5 days and 12.3 days, respectively.

Hazard of Night Work

Frequency and severity rates for day and night work are shown in charts, the former chart covering the years 1905-1913, inclusive. In 1905 the night frequency was 385 accidents per 1,000 employes, as compared with a day frequency of 219, while the night severity was 21 days and the day severity 10 days. In 1913 the night frequency was 139 accidents per 1,000 and the day frequency 101 accidents. The night severity was 12 days lost time, and the day severity 6 days lost time. The same data are shown in another chart, but are distributed by departments as follows:

	Night frequency.	Day frequency.	Night severity.	Day severity.
Blast furnaces.	229	204	24	16
Steel works...	224	218	17	12
Rolling mills..	160	150	8	7.8
Mechanical ...	389	122	7	18
Entire plant...	214	142	15	9

The nature of the exhibits and the character of hazards to the public against which they are directed shown by the bureau of standards are interesting, and among other things show hazards due to failed rails, failure of buildings, bridges and other structures by industrial processes, failed steel, brick, etc. The exhibit also explains work being done by the bureau, such as that relating to heat resistive qualities of materials used in fireproofing, partly with reference to its mechanical strength at high temperatures. Visitors are also told that the bureau has also been testing the strength of structural steel columns.

Schwab Buys Pennsylvania Steel Co.

Bethlehem Corporation Takes Over Important Steel Manufacturing and Ship Building Interest—Now Largest of Independents

New York, Feb. 22.—Charles M. Schwab celebrated his fifty-fourth birthday by adding the Pennsylvania Steel Co. to the properties embraced in the Bethlehem Steel Corporation. The final steps in the purchase of the Pennsylvania Steel Co., under renewed negotiations with the Pennsylvania Railroad Co., the Reading Co., and W. H. Donner, owners of about 76 per cent of the stock, were taken in New York on Feb. 18, formal announcement to that effect being made that day. The agreed prices for the transfer are 100 for the preferred and about 27 for the common stock, which, it is stated, represents a total sum approximating $31,900,000 for the entire stocks of $25,000,000 preferred and $25,000,000 common. At present, $20,587,500 in preferred and $10,750,000 in common stock is still outstanding. Payment is to be made to the Pennsylvania and Reading railroad interests in Bethlehem Steel Corporation bonds, while the other holders will receive cash.

The formal announcement of the closing of the transaction is as follows:

"The purchase price aggregates approximately $31,900,000, which is at the rate of par on the preferred and about $27 per share on the common stock of the Pennsylvania Steel Co. This amount is to be paid in 5 per cent 20-year purchase money bonds of the Bethlehem Steel Corporation, secured by mortgage upon the purchased property, with the reservation of bonds to retire underlying issues and to provide for improvements and additions.

"This acquisition is the outcome of the determination reached by the Bethlehem Steel Corporation some time ago to add to its output bessemer steel products and other general steel lines, such as bridges, frogs and switches, girder rails, rail fittings, etc. For a number of reasons it seems that it would be better to accomplish these enlargements by acquiring the plant of the Pennsylvania Steel Co. rather than to await the erection of additional plants at Bethlehem. The Pennsylvania Steel Co. plant admirably supplements those at Bethlehem.

"The Sparrows Point plant gives to Bethlehem a plant at the seaboard which it has long desired for the development of its export trade. The purchase also brings favorable ore properties both in this country and in Cuba, and also important coal deposits."

The properties of the Pennsylvania Steel Co. consist of blast furnaces, steel works and finishing mills at or near Steelton, Pa.; blast furnaces, steel works, a rail and billet mill and a shipbuilding plant at Sparrows Point, Md., the latter being operated by the Maryland Steel Co., a subsidiary. The Pennsylvania Steel Co., through its subsidiary, the Spanish-American Iron Co., owns and operates very large iron ore deposits in Cuba. In recent years it has been shipping about two-thirds of the annual ore output of the island.

The Bethlehem Steel Corporation, by the acquisition of the Pennsylvania Steel Co., becomes by a wide margin, the largest independent steel producer of the country, with a rated annual capacity of about 2,500,000 tons of pig castings and 2,180,000 tons of finished steel. The Midvale Steel & Ordnance

To Erect Tin Plant

Construction work is expected to start immediately on the plant of the Baltimore Sheet & Tin Plate Co., Baltimore, whose issue of $1,500,000 preferred stock recently was floated successfully. The plant will have a capacity of approximately 1,000,000 boxes of tin plate annually. Construction will begin March 1, and it is expected the mills will begin operating by next autumn. The preferred stock of the new company is convertible into common at par at any time, except when transfer books are closed. The 7 per cent cumulative dividends will be payable semi-annually from next October.

The tin plate company is only one of a number of enterprises which have been launched by J. E. Aldred since he became identified with the commercial life of Baltimore. Much tin plate is used by Baltimore industries, that city being termed locally the largest consumer of that commodity in the country.

Careers of Schwab and Corey Still Parallel

CHARLES M. SCHWAB has wrested from W. E. Corey the leadership of the largest steel organization in the United States, apart from the United States Steel Corporation. Mr. Corey's claim to this distinction was short-lived. When the Midvale Steel & Ordnance Co. took over the Cambria Steel Co., Feb. 7, the consolidation became the largest independent steel producer of the country. The Bethlehem Steel Corporation, with the Pennsylvania Steel Co. properties, now takes a wide lead in tonnage output.

The striking parallel in the business careers of Mr. Schwab and Mr. Corey is further extended by the latest consolidation. Mr. Corey steadily has followed in Mr. Schwab's footsteps in filling some of the most responsible positions in the American steel trade. From a subordinate post in the mills, the advance of the two men carried them in turn to the superintendency of the Homestead works of the Carnegie Steel Co., then to the presidency of the Carnegie Steel Co. and, finally, to the presidency of the Steel Corporation. Both resigned the post of chief operating officer of the world's biggest steel producer to develop other enterprises. Both now are the executive heads of the two largest independent steel companies of the country and command powerful competing forces.

The elevation of Eugene G. Grace to president of the Bethlehem Steel Corporation, adds another step to the brilliant career of one of the youngest steel executives in the business. Mr. Grace now is 39 years old, the same age at which Mr. Schwab became president of the Steel Corporation in 1901. He has been president of the Bethlehem Steel Co. for several years.

The blast furnace capacity of the respective companies is as follows:

	Furnaces	Tons Annually
Bethlehem Steel Co...	7	1,000,000
Pennsylvania Steel Co.	8	840,000
Maryland Steel Co...	4	657,000
Total	19	2,497,000

The crude steel and finishing capacity is as follows:

	Bess. Conv'rs	O.H. Furs.	Ingots Annually	Fin. output Annually
Beth'lm. Steel Co.	2	33	1,020,000	780,000
Pa. Steel Co.....	2	10	1,515,000	900,000
Md. Steel Co.....	3	5	600,000	500,000
Total	7	48	3,135,000	2,180,000

In addition, the fabricated steel capacity of the combination is 150,000 tons annually. The Maryland Steel Co. adds to the several ship building plants already embraced in the Bethlehem Corporation a capacity for building seven large ocean freight steamers at one time.

Big Chilean Order Boosts Market

State Railways Close Huge Tool Contract—Foreign Sales for Large-Swing Lathes Are Growing—Railroads Issue Extensive Lists—Crane Builders Rushed

THE chief development in the machine tool market during the past week was the letting of a huge contract, involving the buildings and complete equipment for large new railroad shops to be built in Chile along the lines of the Chilean state railways. This contract was let, in its entirety, to a leading American machine tool house, having headquarters in New York. While details are not announced, it is believed, from the point of view of the outlay involved, that this is the largest contract of its kind ever booked in this country from abroad. The award was no surprise, since the negotiations leading to the settlement of this business had been carried on over a period of approximately two years. A large part of the work involved, such as the erection of the buildings, is expected to be sub-let to other American concerns. The buildings and equipment are expected to be ready for operating in from one to two years.

Further great activity has developed in the demand for 36-inch and other large-swing lathes suitable for making 12-inch shells. These inquiries are the result of negotiations which have been opened by one of the belligerent powers for the placing of large new contracts, involving shells of this diameter, and also, to a smaller extent, 9-inch shells. The identity of the government is not disclosed, but present indications are that the contracts will be divided up between the Westinghouse interests, the Crucible Steel Co. of America, the General Electric Co., and perhaps one or two other concerns. The lathe inquiries, which have been put out by these concerns involve the earliest delivery obtainable, which, in most cases, is July and August, although limited numbers can be delivered prior to that time.

Seaboard Air Line Issues List

Inquiries for machine tools by the railroads are again active. The most important railroad list now before the trade is one issued last week by the Seaboard Air Line, on which bids are wanted by Feb. 28. The tools involved are for installation at various points along the company's lines, and among them are two 36-inch, single-end punch and shears; two 2-inch double-head bolt cutters; one flanging clamp; two steam hammers; two 42-inch upright drills; one pneumatic press; one 36 x 36-inch x 10-foot planer; one No. 2 drill grinder; one 36 x 44-inch side-head boring mill; one 32-inch crank shaper; one 42-inch, heavy-duty car wheel lathe; one double-axle lathe, and one 20-inch x 10-foot, heavy-duty engine lathe. The Pennsylvania railroad is asking prices on a fair-sized list of tools for its lines east. The New York Central and the Lehigh Valley also have put out fair-sized lists. The Western Pacific railroad, Chicago, also is taking bids on considerable equipment. A noteworthy feature of railroad buying at present is that these interests instead of putting out extensive lists, as has been their custom in the past, now are taking figures on smaller lists, which they are anxious to close without delay. Among railroads which placed good orders during the week is the Baltimore & Ohio.

Domestic business continues brisk, but not many large inquiries or orders are noted. The Baltimore Ship Building & Dry Dock Co., Baltimore, has made large purchases of punching and shearing machinery, which are additional to the purchases made by this concern some three months ago. The Texas Co. has bought considerable equipment, including punching and shearing machinery, for installation in the ship building plant in Maine, which it recently purchased. The Chino Copper Co., New York, has let good orders for machine tools. The Alaskan Engineering Co., Seattle, is taking bids on an extensive list of equipment for use in connection with the government railroad which it is constructing in Alaska. Domestic war munition makers continue to pick up a tool here and there for early delivery.

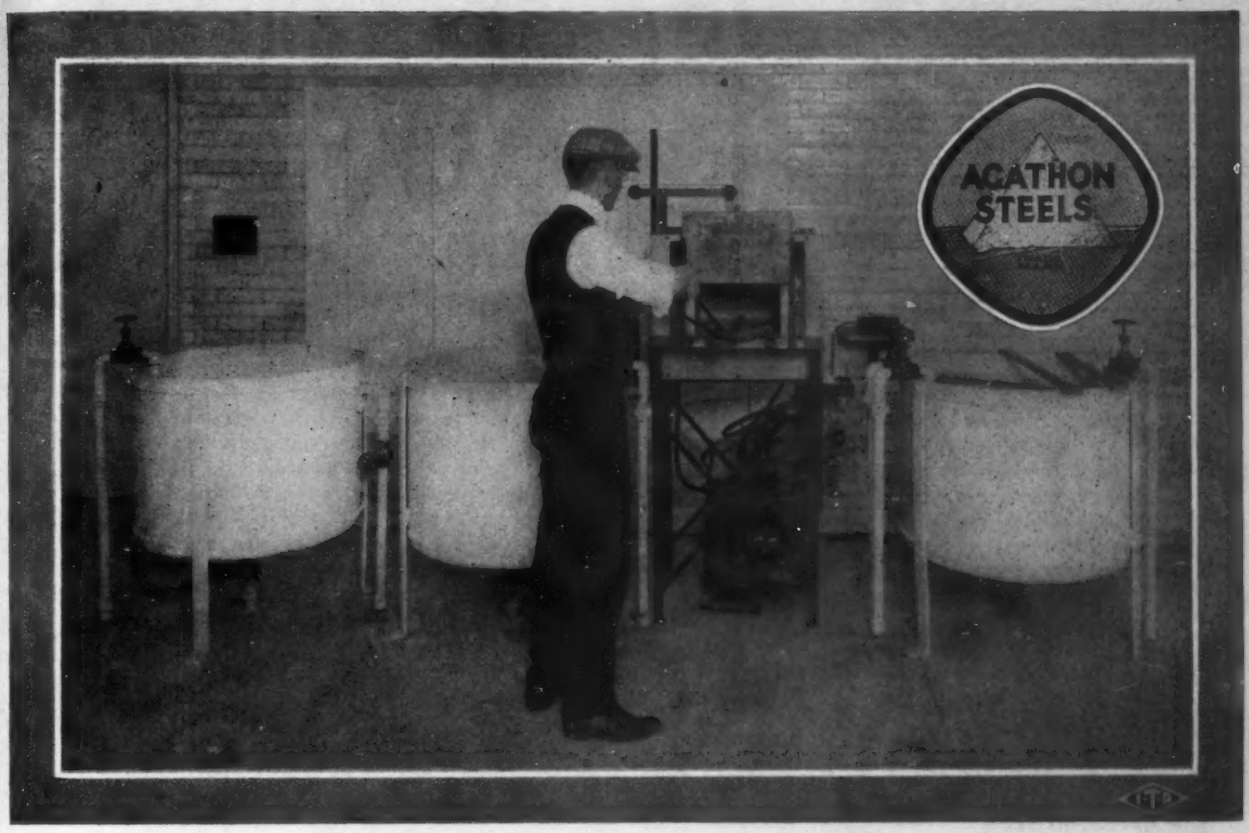
Substantial Crane Orders Placed

The crane market reflects considerable activity. The Midvale Steel & Ordnance Corporation has closed a contract for twenty 5-ton Niles cranes. The Warren Foundry & Machine Co., Phillipsburg, N. J., has bought four Niles cranes. The Harlan & Hollingsworth Corporation, Wilmington, Del., has let a contract for an 85-foot span gantry crane. The Davidson Chemical Co., Baltimore, has let a contract for two bucket-handling, gantry, dock cranes, with cantilever arms arranged to give clearance to vessels, to the Northern Engineering Co. The Kutztown Foundry & Machine Co., Kutztown, Pa., has bought a 25-ton Pawling & Harnischfeger crane. The Erie City Oil Co. has purchased a 25-ton Niles crane. The Bethlehem Steel Co. has placed some further crane orders. The Gulf Refining Co. is in the market for several cranes and also for a pair of bending rolls, for installation at Beaumont, Tex. The crane inquiry put out by the Russian commission still is pending.

The export demand for machine tools is rather quiet, as far as actual business is concerned, although inquiries continue plentiful. J. P. Morgan & Co. again are making earnest efforts to buy lathes for early shipment to England. Considerable machinery consigned to Europe was damaged or destroyed on Feb. 16 by fire which caused serious damage to the steamers BOLTON CASTLE and PACIFIC, at the New York Dock Co.'s docks in Brooklyn.

Extensive Improvements Planned

Among concerns in the east, which are expanding their capacity, are: The C. G. Garrigus Machine Co., Bristol, Conn.; D. E. Whiton Machine Co., New London, Conn.; Gorham Mfg. Co., Providence, R. I.; Irvington Mfg. Co., Irvington, N. J.; Valley Iron Works, Williamsport, Pa.; Fore River Ship Building Corporation, Quincy, Mass.; Central Machine Co., Philadelphia; Blakesley Forging Co., Plantsville, Conn.; Colburn Machine Tool Co., Franklin, Pa.; Keystone Forge Co., Northumberland, Pa.; American Emery Wheel Co., Providence, R. I.; Brown & Sharpe Mfg. Co., Providence, R. I.; Harlan & Hollingsworth Corporation, Wilmington, Del.; Hess-Bright Mfg. Co., Philadelphia; Stewart & Stevens' Iron Works, Phila-



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delphia; Franklin Machine Co., Providence, R. I., and the Philadelphia Textile Machinery Co., Philadelphia.

Domestic Orders Keep Chicago Busy

SALES of machine tools to domestic manufacturers in practically all lines continue to feature the Chicago market. Many dealers state this demand is heavier than has been experienced for several years. Not only is inquiry heavy, but wherever dealers are able to supply equipment, sales are made promptly. Manufacturers of tractors have been in the market actively recently and taken considerable equipment, while automobile builders are also seeking further requirements. Both the Inland Steel Co. and the Illinois Steel Co., which are making large additions to their plants at Indiana Harbor and Gary, Ind., are preparing to enter the market, and, as construction progresses, are taking an occasional tool to assist in the work. A sale recently was made by one dealer of about 30 tools to a manufacturer in the west, who is enlarging his business to care for a munitions order. Export business has not disappeared, but is in less volume than formerly. Complete equipment for a large general machine shop in Sweden was disposed of in this market last week. A large order for general purpose tools is being filled for shipment to England. Railroads are taking only occasional tools and apparently are not ready to issue large lists. Deliveries from manufacturers are beginning to come through steadily, and this fact, coupled with the decline of export business, accounts for a falling off in the demand for second-hand tools.

Pittsburgh Market Slow

NUMEROUS inquiries for machine tools for manufacturing plants in the central west are pending in the Pittsburgh district, but no orders of importance have been placed recently. The Driggs-Seabury Ordnance Co., Sharon, Pa., continues to buy lathes for the manufacture of shells, but other munition makers, including the Westinghouse interests, have withdrawn from the market. An inquiry for 200 lathes for export has just come out, but dealers here are unable to entertain it, because of inability to meet delivery specifications. The National Steel Casting Co., which will build a new plant at New Cumberland, W. Va., and the Sligo Iron & Steel Co., Connellsville, Pa., are negotiating for foundry and rolling mill equipment. Corporation subsidiaries are figuring for single tools for replacements. The Carnegie Steel Co. soon will close for rolling mill equipment for its plant at McDonald, O.

Cleveland Market on Up-Grade

THE machine tool market in Cleveland is recovering from the period of quiet that affected it for several weeks. There have been no large single sales, but the volume of business as a whole has been of fair proportions. The American Steel & Wire Co. is in the market for considerable equipment. The Newburgh & South Shore railroad has issued a list of tools for installation in its car shops and is still in the market for several machines. The Lake Shore railroad has issued a list of tools and is receiving bids for additional requirements. Several Ohio tool builders have notified the trade that a 10 to 15 per cent increase had been made, some schedules to be effective Feb. 15 and others March 1.

Cincinnati Market Awake, But Quiet

MACHINE tool builders in Cincinnati are now giving practically all of their attention to domestic trade. European demand is mostly for immediate shipment, which cannot be made by the majority of shops in that city. The Indianapolis Heat & Light Co. will soon purchase equipment to the extent of about $1,000,000 for its new plant, and the board of education of Cincinnati will enter the market shortly for machine shop and foundry equipment for the East high school. Bids will be received until March 1 for the construction of the plant of the R. K. Le Blond Machine Tool Co., which will be one of the largest machine tool plants in the middle west, and the American Tool Works Co. has begun work on its extensive plant. Equipment for the new addition of the John Steptoe Shaper Co. will be installed by early spring.

Among New England Factories

ROCKLAND, ME.—The Islands Electric Co. has been incorporated; $100,000 capital stock; by Harold S. Hichborn, New York, Alden S. Hichborn, New York, and A. S. Littlefield.

BOSTON.—J. H. McNamara has been incorporated as general contractor; $40,000 capital stock; by John H. McNamara, Mary E. McNamara and Mary McNamara.

BOSTON.—Bozark Zinc Co. has been incorporated; $150,000 capital stock; by Louis Meynel, Lewis S. M. Glidden and Thomas I. Rogan.

BOSTON.—A permit has been granted to W. Stanley Tripp to erect a 6-story, 102 x 114-foot, brick and concrete, light manufacturing building at 112 Shawmut avenue.

BOSTON. — The Westinghouse Air Spring Co. has been incorporated; $50,000 capital stock; by Howard G. Davis, president; Grosvenor Calkins, Newton, treasurer, and G. O. Mitchell.

BOSTON. — The Eliot Five Cent Savings bank has awarded contract for a brick and stone, 1-story, 53 x 92-foot bank building to cost $100,000 at Dudley street and Harrison avenue.

BOSTON. — The Commonwealth Acid Phosphate Co., Dover, Del., which is represented by Henry C. Sawyer, 517 Exchange building, Boston, is having plans drawn by the Pratt Engineering Co., Atlanta, Ga., for a 3-story chemical plant to be erected at Medford, Mass., at a cost of $250,000.

LAWRENCE, MASS.—The Menomac Spinning Co. will erect a brick, mill construction, 2-story, 92 x 500-foot spinning mill and power plant to cost $150,000 on South Union street.

MALDEN, MASS.—The Converse Rubber Co. is about to begin work on the construction of a 4-story factory addition, 68 x 150 feet, and on a store house, 50 x 200 feet. The contract has been awarded to the National Engineering Co., New York.

MERRIMAC, MASS.—Jonah & George have awarded contract for an addition to their foundray to be used as a moulding room and will equip it with new machines.

QUINCY, MASS.—Plans are being drawn by Monks & Johnson, architects, 78 Devonshire street, Boston, for a 2-story, 75 x 500-foot, woodworking building to be erected at a cost of $500,000, at Quincy, Mass., for the Fore River Shipbuilding Corporation.

SALEM, MASS. — J. W. Aulson & Son, Lynn, Mass., and Chicago, have purchased the Merrow Machine Co., Oak street, and will continue the business.

SOMERVILLE, MASS. — The By-Product Reclaiming Corporation, 29 Front street, has let a contract for the erection of a 1-story, 100 x 100-foot factory building.

SPRINGFIELD, MASS. — Smith Carriage Co. has awarded contract for a brick and steel fireproof, 4-story, 60 x 166-foot garage and repair shop to cost $100,000 on Park street.

SPRINGFIELD, MASS. — The Connecticut Valley Screen Co., has been incorporated; $15,000 capital stock; by Charles S. White, Edwin A. Davenport and Alfred H. Morton.

SPRINGFIELD, MASS.—Plans are being drawn for an extension to the State street plant of the United Electric Light Co., which

Crawford Ore from the Dean-Itasca Mine on the Mesabi Range

The ore is non-bessemer, of good coarse structure. Dean-Itasca mine shipments for 1915 were 486,374 tons, mostly since August 1. For 1916 they will be considerably greater.

A complete analysis of Crawford Ore from Dean-Itasca Mine in natural state and dried at 212° Fahr.

	Dried 212°	Natural
Iron	58.35	50.2451
Phosphorus	.065	.05597
Silica	6.03	5.1924
Manganese	1.00	.8611
Alumina	3.40	2.9277
Lime	.16	.1377
Magnesia	.12	.1033
Sulphur	.031	.0266
Volatile Matter	5.74	4.9427
Moisture	13.89	

Crawford Ore Guarantee for 1916, 51.50 Per Cent Iron, Natural

The output of this mine during 1916, together with our five other mines, gives us an unusually large tonnage.

We are now taking contracts for this ore and will be glad to figure on your requirements for the coming season.

THE TOD-STAMBAUGH COMPANY

Perry-Payne Building

CLEVELAND :: :: :: :: OHIO

will practically replace its present one. The building will be of concrete, brick and steel.

SPRINGFIELD, MASS. — Plans have been prepared for a concrete 1-story, 68 x 203-foot factory for William J. Hyland, on Liberty street.

PAWTUCKET, R. I.—Plans have been prepared for a brick, 2-story, 60 x 160-foot mill to cost $30,000, for the Rhode Island Textile Co.

PAWTUCKET, R. I.—A contract has been awarded for a brick and steel, 1-story, 101 x 212-foot addition to cost $34,000 to the plant of the Potter & Johnston Machine Co. on London avenue which will be used for a crane room.

PROVIDENCE, R. I.—The Brown & Sharpe Mfg. Co. has let a contract for a 1-story, 66 x 76-foot addition to its plant.

PROVIDENCE, R. I.—The Gorham Mfg. Co. has let a contract for the construction of a 1-story, 122 x 144-foot building, with a 35 x 56-foot wing.

PROVIDENCE, R. I.—The Atlas Co. has been incorporated to do a general contracting and construction business; $20,000 capital stock; by Samuel F. McIntosh, Earl C. Whelden and Charles C. Remington.

PROVIDENCE, R. I.—The American Silk Spinning Co. has let contracts for the construction of several new buildings, including a weave shed, a dye house and a chemical building.

PROVIDENCE, R. I. — The Franklin Machine Co., which has changed ownership, has begun work on improvements and will install considerable machinery. The company manufactures shafting, hangers and special machinery and operates an iron foundry. E. B. Hough is the president.

PROVIDENCE, R. I. — The American Emery Wheel Co., 325 Waterman street, has let a contract for the erection of a 1-story and basement, 50 x 75-foot kiln building. The latter will be provided with two kilns.

BRIDGEPORT, CT.—The William P. Kirk Co. is contemplating erecting a brick, 3-story, 110 x 130-foot store and factory building to cost $75,000, for its own occupancy.

BRIDGEPORT, CT.—The Bridgeport Electric Mfg. Co. has organized; $5,000 capital stock; by Per Berggren, John Weckman, Alexander Hedin, Charles S. Ferrett and Andrew P. Nichols.

BRIDGEPORT, CT.—The three main buildings of the plant of the Farist Steel Co., were damaged by fire, causing a loss of $450,000. The company was furnishing steel for the Remington Arms & Ammunition Co., but was not filling any specific orders for munitions.

BRISTOL, CT. — The C. G. Garrigus Machine Co. is having plans drawn for a 2-story, 80 x 96-foot addition to its plant on Riverside avenue.

DANIELSON, CT.—Business men are raising $75,000 to build a 3-story, 150 x 275-foot mill in Industrial place.

GLASTONBURY, CT. — The Glastonbury Knitting Co. will build a brick, mill construction, 4-story and basement, 55 x 60-foot addition to its factory, which will have a 5-story tower, 16 x 16 feet.

GROTON, CT.—The New London Ship & Engine Co. will erect two brick and steel additions to its plant, one of which will be used by the pattern department.

HARTFORD, CT.—Gordon Bros. will build a brick, mill construction, 3-story and basement, 50 x 100-foot warehouse on Church street.

NEW HAVEN, CT.—The United Smelting & Aluminum Co., has awarded contract for a brick and steel, 3-story, 76 x 112-foot factory on Commerce street.

NEW LONDON, CT.—The D. E. Whiton Machine Co. has had plans prepared for a 150 x 200-foot addition to its plant.

NEWTON, CT.—The M. H. Hart Co., Inc., has been incorporated to make fire department appliances; $10,000 capital stock; by M. H. Hart, W. T. Cole, Julius Harting and C. S. Cole.

SOUTHINGTON, CT. — The Blakesley Forging Co., Plantsville, Ct., has taken bids on the construction of a 1-story and basement, 50 x 80-foot forge shop here.

WATERBURY, CT. — The Waterbury Press, Metal & Tool Co., has been incorporated; $20,000 capital stock; by Alfred L. Schwartz, August G. Jordan and Ernest S. Austin.

WINDSOR LOCKS, CT.—Fire damaged the factory of the Anchor Paper Co., causing a loss of $100,000.

Along the Middle Atlantic Seaboard

BROOKLYN, N. Y.—The plant of Rotary File & Machine Co., 176 North Fourth street, was damaged by fire.

BROOKLYN, N. Y.—The plant of New York Stamping Co., 33-47 Henry street, damaged by fire.

BROOKLYN, N. Y. — The Gasolene Distributing Co., Maspeth, is preparing to erect a plant.

BROOKLYN, N. Y.—Robert Gair Co. has let a contract to the Turner Construction Co., 11 Broadway, New York, for a 12-story and basement, 106 x 114-foot paper factory.

BROOKLYN, N. Y.—The Bush Terminal Co., 100 Broad street, New York, has let contracts to the Turner Construction Co., 11 Broadway, New York, for two factory buildings, 12 stories, 125 x 200 feet, and six stories and basement, 75 x 460 feet, respectively.

BUFFALO, N. Y.—H. P. Henschien, architect, 39 West Van Buren street, Chicago, is drawing plans for an 8-story and basement, 80 x 116-foot, cold storage warehouse to be erected in Buffalo by the Jacob Dold Packing Co., 745 Williams street.

JAMESTOWN, N. Y.—The Fairmount Machine Mfg. Co. has been incorporated to build engines, boilers, machinery specialties and tools; $50,000 capital stock, by Oscar A. Lenna, Edward C. Fliege and Luther S. Larken Jr.

LONG ISLAND CITY, N. Y.—Ballinger & Perrot, architects, 1701 Arch street, Philadelphia, are drawing plans for a 6-story, 40 x 380-foot and 1-story, 50 x 180-foot factory to be erected in Long Island City. Philip Landgren, Hotel Biltmore, New York City, is owner.

LOUDONVILLE, N. Y. — Chas. C. Grant, architect, 37 West Twenty-eighth street, New York, has plans in progress for a pump house to be erected in Loudonville for Fred G. Peabody.

NEW YORK.—The Gulf Refining Co. is in the market for bending rolls and for several cranes to be installed at Beaumont, Tex.

NEW YORK—J. P. Morgan & Co. again are inquiring actively on lathes for early shipment to England.

NEW YORK.—The Lehigh Valley railroad is inquiring for prices and deliveries on a few tools.

NEW YORK.—The New York Central railroal is taking prices on a list of machine tools.

NEW YORK.—The Pennsylvania railroad, lines east, has put out a small list of machine tools on which it is asking prices and deliveries.

NEW YORK.—The Standard Oil Co., 26 Broadway, has let a contract to the H. D. Best Co., 52 Vanderbilt avenue, for the construction of several pumping stations, for which it now is drawing the plans. These will be located at Morristown, Phillipsburg and Somerville, N. J.

NEW YORK.—Buchman & Fox, architects, 30 East Forty-second street, have completed preliminary plans for a 6-story, 40 x 97-foot silk mill to be erected for the Tremont Silk Mills at a cost of $70,000. S. K. Jacobs, 428 Fourth avenue, is interested in the latter company.

NEW YORK.—The Seaboard Air line is receiving bids until Feb. 28 for the following equipment, which is to be installed at various points along the company's line: Two 36-inch single-end punch and shears; two 2-inch double-head bolt cutters; one flanging clamp; two steam hammers; one grindstone; two 42-inch upright drills; one pneumatic press for straightening steel car parts; one 36 x 36-inch x 10-foot planer; one No. 2 drill grinder; one 36 x 44-inch side-head boring mill; one 32-inch crank shaper; one 20-inch x 10-foot heavy-duty engine lathe; one 42-inch heavy-duty car wheel lathe and one double axle lathe.

ASBURY PARK, N. J.—The Hollow Steel Tool Co. has been incorporated to manufacture steel tools and handles; $150,000 capital stock; by William A. Barry, Arthur Steinbach, David Eastman, Asbury Park.

ATLANTIC CITY, N. J.—The Montaque & Howe Co. has been incorporated to build submarines, hydroplanes, etc.; $100,000 capital stock; by Harold E. Montaque, Atlantic City, George W. Howe and Homer R. Montaque, Binghamton, N. Y.

DOVER, N. J.—The Eastern Pennsylvania Power Co., which recently purchased the abandoned plant of the Morris County Traction Co., contemplates the construction of a $200,000 plant in Dover. The company's other plant at Boonton will be abandoned.

EAST ORANGE, N. J.—The Atlantic Aircraft Co. has been incorporated to build and operate aeroplanes and hydro-aeroplanes; $150,000 capital stock; by Harry H. Picking, Charles O. Guyer, Gordon Grand, East Orange.

GLOUCESTER, N. J.—The Welsbach Co., is erecting six steel and concrete buildings at a cost of $1,000,000.

IRVINGTON, N. J.—The Irvington Mfg. Co. has let a contract for the construction of a 1-story addition to its tool factory.

NEWARK, N. J.—The Marden, Orth & Hastings Co. will build a factory 80 x 100 feet to cost $14,000, and a boiler house 80 x 110 feet, to cost $5,000, along the Newark meadows.

NEWARK, N. J.—The Gainor Meter Co. will build an addition to its plant.

NEWARK, N. J.—Chief Engineer Osgood is completing the plans for a bridge across the

Newark bay for the New Jersey Central railroad. The plans will be submitted to the war department in two weeks. The new structure will be steel and concrete and will carry four tracks. The main draw over the navigation channel will be 24 feet above mean high tide. This bridge, with other structures for the company at Newark, will cost more than $2,000,000.

NEW BRUNSWICK, N. J.—A 4-story office building will be erected by the Pratt-Brown Co. to cost $90,000. Ira S. Crouse has the contract.

TRENTON, N. J.—The New Jersey legislature has appropriated $150,000 for the erection of more buildings for the state Hospital for the insane in Trenton. Work on the buildings will be started in the spring.

APOLLO, PA.—The Apollo Electric Steel Co. has been incorporated; $100,000 capital stock; by Robert Lock, Frank W. Jackson, John H. Jackson, J. E. Gallagher, Apollo; W. E. Troutman, Vandergrift, Pa.; Walter J. Guthrie, G. Arthur White, Pittsburgh.

BUTLER, PA.—Spang & Co. has increased its capital stock from $200,000 to $500,000. The company manufactures machinery and oil well supplies.

CONNELLSVILLE, PA.—The plant of the Sligo Iron & Steel Co., recently purchased by Pittsburgh interests, headed by George Frankovitch, is being equipped for the manufacture of steel bars and steel railroad ties.

ELLWOOD CITY, PA.—The Pennsylvania Power Co. will erect a new dam, to provide for an increase in the capacity of the plant.

FRANKLIN, PA.—The French Creek Foundry Co. has been incorporated; $25,000 capital stock; by Robert Ramsey, Robert Carnick, F. L. Liddle, August S. Karns and R. R. Bleakley, all of Franklin.

FRANKLIN, PA.—S. D. Brady, architect, Franklin Trust building, will take bids about March 15, on a 1-story, 20 x 100-foot machine shop addition, to the plant of the Colburn Machine Tool Co.

KITTANNING, PA. — The plant of the Kittanning Iron & Steel Mfg. Co., idle for three years, will resume operations at an early date. Numerous repairs and improvements are being made.

NEW CASTLE, PA.—It is reported that the Burton Powder Co. has purchased 30 acres from C. E. Fullerton, near Covert station, and will erect an addition, to cost $1,000,000.

NORTHUMBERLAND, PA.—The Keystone Forge Co. contemplates the erection of a 2-story forge shop addition.

OIL CITY, PA. — The Brockway, McNeil Co., architect, Warren, Pa., will receive bids on a 3-story, 30 x 65-foot factory, to be erected in Oil City for the chamber of commerce.

PHILADELPHIA. — Walter H. Tinney, Sixty-third street and Woodland avenue, will build a 1-story, 32 x 65-foot cornice factory.

PHILADELPHIA. — The Central Machine Co., 708 Cherry street, has received bids on the construction of a 4-story, 44 x 110-foot machine shop.

PHILADELPHIA.—Irwin & Leighton are estimating on plans for a 6-story, 165 x 860-foot addition to the plant of the Ford Motor Co., at Highland Park, Mich.

PHILADELPHIA.—Watson & Huckel are preparing plans for a 1-story, 130 x 200-foot addition to the plant of the Hess-Bright Mfg. Co., Front street and Erie avenue.

PHILADELPHIA.—The Hess Steel Corporation, Witherspoon building, has let a contract for the construction of a 1-story, 13 x 24-foot transformer building in Baltimore.

PHILADELPHIA. — Morgenthaler Bros., Second street and Snyder avenue, have let a contract for the construction of a 2-story, 36 x 40-foot, machine shop addition.

PHILADELPHIA.—The Stewart & Stevens' Iron Works has purchased the building at 1718-1722 North Ninth street and the site will be used for the erection of an addition which will be used by the company for its structural iron and steel department.

PHILADELPHIA.—The Pennsylvania Ship Building Co. has been incorporated to build and operate boats and build machinery; $600,000 capital stock; by Haakon E. Norbom, George S. Hoell and Charles H. Moyer, Philadelphia.

PHILADELPHIA.—The Philadelphia Textile Machinery Co. is having plans drawn for several additions, including a 1-story, 152 x 261-foot, brick and concrete structure; a 2-story, 33 x 115-foot office building and a 35 x 142-foot brick, concrete and steel power house.

PITTSBURGH.—The Pittsburgh Metals Co. has been incorporated; $50,000 capital stock; by F. R. Hansell, Philadelphia, and others.

PITTSBURGH.—The Pittsburgh-Des Moines Co. has been incorporated to deal in iron and steel; $300,000 capital stock; by E. W. Crellin, W. H. Jackson, Grafton, Pa.; G. A. Smith, Des Moines, Ia.

PITTSBURGH.—The Par Laboratories have been incorporated; $5,000 capital stock; by E. W. McCarrol, Richard Robinson and Frank McCann.

PITTSBURGH. — The Goodman Engine & Machine Co. has been granted a re-charter, with a capital stock of $45,000. James Hogan is treasurer.

PITTSBURGH.—I. L. Scheimman has leased, for a period of ten years, two 4-story warehouses at 1016-26 Vickroy street, for the manufacture of waste.

PITTSBURGH.—The Pennsylvania railroad will erect a $50,000 freight station at East Liberty. A contract has been awarded to D. T. Riffle.

PITTSBURGH. — The Knox Pressed & Welded Steel Co., which recently erected a plant at Wheatland, Pa., has increased its capital stock from $200,000 to $400,000.

READING, PA.—The Biehl Iron Works has been incorporated; $25,000 capital stock; by Lambert A. Rehr and others.

READING, PA.—The Carpenter Steel Co., Reading, has asked for bids for an extension to its plant, consisting of a new shop building, 70 x 400 feet, one story.

SHARON, PA.—The Standard Slag Co., whose plant was damaged by fire, is erecting a new structure and is installing new equipment.

SHARON, PA.—The Shenango Machine Co., with works on North Water street, has increased its capital stock from $60,000 to $75,000, and will increase the capacity of its plant.

VOLANT, PA. — The Youngstown Clay Products Co. plans to increase the capacity of its plant in Volant at an early date. Four dry kilns and three burning kilns will be installed.

WASHINGTON, PA.—Fire did about $20,000 damage to the plant of the Jessop steel mill, an English concern engaged in making munitions.

WILLIAMSPORT, PA. — The Valley Iron Works has let a contract to J. V. Bennett & Co. for the construction of a cupola house.

WILLIAMSPORT, PA. — T. J. Litzleman, architect, 149 West Fourth street, has plans in progress for a 1-story foundry. The owner's name is withheld.

WILMINGTON, DEL.—The Harlan & Hollingsworth Corporation has let a contract to the Fred A. Havens Co. for the erection of a 62 x 210-foot lumber storage building, and a 50 x 200-foot blacksmith shop.

Activities in the Central States

CINCINNATI.—The Ferro Concrete Construction Co. has secured the contract to erect a 6-story office building in Madison, Wis., at a cost of $160,000.

CINCINNATI.—The Edgemont Machine Co. has increased its capital stock from $15,000 to $75,000 and will build an addition for the increased production of friction clutches and transmission machinery.

CINCINNATI.—The John Steptoe Shaper Co. has let several contracts for the construction of an addition to its factory building in Camp Washington, and will be ready to install equipment by spring.

CINCINNATI.—The Resor Mfg. Co. has been incorporated to manufacture gas stoves and ranges; capital stock, $10,000; by C. S. Resor, Telford Groesbeck, W. S. Groesbeck, C. B. Groesbeck and K. Resor.

CLEVELAND.—The Republic Brass Co. has been incorporated; $25,000 capital stock; by E. H. Blywise, E. P. Strong, F. A. Cook, George Q. Koley and Fred Desberg.

DAYTON, O.—A 12-story office building 32 x 142 feet, will be erected at 45 South Main street. The concrete work has been let to the Ferro Concrete Construction Co., Cincinnati.

KENT, O.—The Cleveland Steel Valve Co. will occupy the plant of the Seneca Chain Co., having taken the latter plant over on lease. The Standish Chain Co., now occupying a portion of the building, will remain in its present quarters.

TOLEDO, O.—The Tillotson Mfg. Co. has been making 500 carburetors a day and plans to increase its capacity, according to Harry C. Tillotson, president of the company.

YOUNGSTOWN, O.—An announcement has been made from the Youngstown branch of the Carnegie Steel Co. that the company will erect a 3-story, 100 x 150-foot office building. The proposed structure will be erected at the intersection of Salts Spring road and Waverly avenue.

BLUEFIELD, W. VA.—Samuel L. Martz will build a 3-story office building, 80 x 125 feet.

HUNTINGTON, W. VA.—The Empire Furniture Co., Twenty-third street and Second avenue, has awarded a contract to Henry Persun, 902 Eighth street, for the erection of a 2-story addition, 60 x 75 feet. Versus T. Ritter, First National Bank building, is the architect.

JENKINJONE, W. VA. — The Pocahontas Consolidated Collier Co. will build a 3-story reinforced concrete store building, plans for which will be prepared by S. V. Garrett, Pocahontas, W. Va.

MAKEN STATION, W. VA. — W. L. Mustard will erect a 3-story theater and apartment building, 25 x 121 feet, plans for which

have been prepared by Pedigo & Gary, architects, Bluefield, W. Va.

MOUNDSVILLE, W. VA. — The Mound City Cut Glass Co. will ask bids on materials for the construction of a corrugated iron and timber building, 60 x 140 feet. J. L. Bonar, 1500 Fourth street, has the plans.

PARKERSBURG, W. VA. — Scheesley & Janey, Johnstown, Pa., have been awarded the contract for grading and building a retaining wall for the freight station for the Baltimore & Ohio railroad. Bids on the building, 40 x 70 feet, will be asked in the spring.

WHEELING, W. VA.—The American Sheet & Tin Plate Co. is taking bids on the erection of a 1-story and basement, hollow tile office building at the LaBelle plant.

WHEELING, W. VA. — The Wellsburg & Eastern railroad has been incorporated; $5,000 capital stock; by Henry I. Arbenz, Carl O. Schmidt, Nell Moran, E. S. Romine and Harry O. Wells, all of Wheeling. A line will be built through Brooke county to the Pennsylvania line near Dunsford, Pa.

ANDERSON, IND.—The International Ordnance & Engineering Corporation has been capitalized at $100,000 to manufacture army and navy equipment. The directors are Robert J. Walker, Clarence R. Berkshire and Raymond Stull.

COLUMBUS, IND.—The Columbus Foundry Co. has been incorporated; $1,500 capital stock; by Benjamin W. Lewis, Albert N. Patton and John M. Northam.

FT. WAYNE, IND.—The Ft. Wayne & Decatur Traction Co. has been incorporated to build a traction line from Ft. Wayne to the Ohio-Indiana line; $200,000 capital stock; by William J. Vesey, Edward X. Ehinger and G. M. Leslie.

INDIANAPOLIS.—The Stutz Motor Car Co. is building a 4-story factory, 80 x 205 feet, to cost $80,000.

INDIANAPOLIS.—The M. S. Co. has been incorporated to manufacture automobiles heaters; $10,000 capital stock; by W. E. Munk, J. C. Schaf and R. G. Lockwood.

INDIANAPOLIS.—The Heaton Engine Co. has been incorporated to build engines; $20,000 capital stock; by Otis Heaton, T. H. Johnson and A. M. Burk.

INDIANAPOLIS.—The Everett-Buschmann Co. has been incorporated to build power plait specialties; $1,000 capital stock; by William J. Everett, T. B. Everett, A. W. Buschmann and O. L. Buschmann.

INDIANAPOLIS. — The D. & M. Mfg. Co. has been incorporated to manufacture electrical devices; $12,000 capital stock; by Oscar Dietz, Clarence E. Mills and W. D. Jones.

INDIANAPOLIS. — The Indianapolis Heat & Light Co. will build a power plant on the site of the present building on Kentucky avenue. The building will cost about $250,000, and equipment will amount to over $1,000,000.

KOKOMO, IND.—The Superior Machine Tool Co. will build an addition 70 x 200 feet to cost $50,000. A. L. Thalman is president of the company.

MARION, IND. — The Marion National Bank, J. L. McCullough, president, is having plans prepared for a 7-story building, 66 x 132 feet. D. A. Bohlen & Sons, 122 Majestic building, Indianapolis, are the architects.

NEW ALBANY, IND.—The United Gas & Electric Co. is considering electrification of its water works pumping station now operated by steam. Chester P. Wilson, Indianapolis, is president of the company.

PORTLAND, IND.—The Portland Forge & Foundry Co. has let contracts for an addition to its foundry to cost $20,000.

CANTON, ILL. — The Mitchell Machinery Co. has leased the plant of the Great Northern Iron Works and will build road making machinery. Melville Mitchell, Peoria, Ill., is president.

CHICAGO.—The Western Pacific railroad is taking bids on a list of machine tools.

CHICAGO.—The Koshovel Stoking Machine Co. has been incorporated by E. L. Kreamer, D. L. Kilian and A. C. Fordham, 780 Dearborn street.

DECATUR, ILL.—Plans are under way by the Wabash railroad to spend $100,000 on subways.

ELGIN, ILL.—Plans are being prepared for a steel bridge at Kimball street to cost $20,000; Morgan H. Brightman is the city engineer.

FREEPORT, ILL. — The State Bank of Freeport will take bids about March 15 on a 7-story building, 40 x 120 feet. F. A. Carpenter, 420 Brown building, Rockford, Ill., is the architect.

JOLIET, ILL.—The city of Joliet has appropriated $40,000 for bridge work.

LA SALLE.—Bids will be received until March 9 by George L. Farnsworth, county superintendent of highways, Ottawa, for the construction of the Shippingsport bridge, estimated to cost $155,000.

OREGON, ILL.—The Oregon Foundry has been leased by the Paragon Foundry Co. and will be put into operation at an early date. The Paragon company manufactures piano plates.

ROCKFORD, ILL. — The contract for the Morgan street bridge has been let to J. O'Herron, Westcott Engineering Co., 10 South La Salle street, Chicago, at $83,427. The structure will be 400 feet long with 500 foot approach.

WAUKAGAN, ILL. — The Ogren Motor Works will build a plant costing $15,000.

ALBION, MICH.—W. R. Moyes, clerk of the board of public works, has plans for a pumping plant, one story, 40 x 81 feet, to cost $20,000.

BELDING, MICH. — The Grand Rapids Brass Co. will establish a brass foundry at Belding.

DETROIT.—The J. N. Murray Mfg. Co., maker of automobile parts, will build an addition, costing $10,000.

DETROIT.—A garage and factory will be built by A. Wegner & Sons, three stories, 100 x 158 feet, to cost $50,000.

DETROIT.—The Liberty Motor Car Co. has been incorporated to build automobiles; $400,000 capital stock; by Percy Owen, H. M. Wirth and R. E. Cole.

DETROIT.—The Detroit Steel Products Co. will build two reinforced concrete buildings to double its capacity. Walter S. Russell is president.

DETROIT.—The National Can Co. is taking bids through John Scott & Co., architects, 2335 Dime Bank building, for a 3-story factory, 60 x 90 feet.

DETROIT.—The Esco Mfg. Co. has been incorporated to manufacture automobile locks; $100,000 capital stock; by E. R. Schriber Jr., E. M. Classen and F. E. Humphrey.

DETROIT.—The Bour-Davis Motor Car Co. has been incorporated to build automobiles and will erect a plant at once. C. J. Bour, Chicago, A. A. Gloetsner and W. J. Brown, Detroit, are interested.

ESCANABA, MICH.—Plans are being prepared by Burns & McDonnell, Kansas City, Mo., for a water works system to cost $400,000.

FLINT, MICH.—The J. B. Armstrong Co., manufacturer of steel springs, will build a factory, 78 x 132 feet, and 26 x 127 feet, one story, fireproof, to cost $16,000.

FLINT, MICH.—The Buick Motor Co., C. W. Nash, president and general manager, will build a heat treating plant, one story, 55 x 100 feet, to cost $9,000.

GRAND HAVEN, MICH.—The Chicago File & Rasp Co. has bought a plant in Grand Haven and will remove its business here. Additional equipment will be installed.

GRAND RAPIDS, MICH. — The Wolverine Starter Co. has been incorporated to manufacture a mechanical starter for automobiles; $10,000 capital stock; J. Frank Carter is president of the company.

HOLLAND, MICH.—The Michigan Foundry Co. has been incorporated to build a gray iron foundry, 100 x 105 feet; $50,000 capital stock. George E. Kollen is president of the company.

ISHPEMING, MICH.—The Cleveland-Cliffs Iron Co. is considering constructing a hydro-electric plant on Dead river.

MARSHALL, MICH. — Gallagher, Hutchinson & Campbell Bros., of Muskegon Heights, Mich., have leased a factory at Marshall and

Notice!

How quickly real business comes your way when you follow the crowd and read THE IRON TRADE REVIEW'S new business tips.

The Heim Mfg. Co., Amorilla, Tex., is in the market for milling machines, radial drills, lathes, grinders and furnaces.

The Milwaukee Dairy & Supply Co., Milwaukee, is in the market for shapers, planers, milling machines and lathes with individual motor drives.

The Gulf Refining Co., New York City, is in the market for bending rolls and several cranes to be installed in the company's plant at Beaumont, Tex.

The Alaskan Engineering Co., Seattle, Wash., is in the market for milling machines, lathes, surface grinders, a wheel press, drill presses, steam chipping hammers, vises, gages, reamer, taps, etc., to be installed in connection with the government railroad in Alaska.

The Seaboard Air Line railroad, New York City, will receive bids until Feb. 28 for the following equipment: Two 36-inch single-end punch and shear; two 2-inch double-head bolt cutters; one flanging clamp; two steam hammers; one grindstone; two 42-inch upright drills; one pneumatic press for straightening steel car parts; one 36 x 36-inch x 10-foot planer; one No. 2 drill grinder; one 36 x 44-inch side-head boring mill; one 32-inch crank shaper; one 20-inch x 10-foot heavy-duty engine lathe; one 42-inch heavy-duty car wheel lathe and one double axle lathe.

The Maddox Foundry & Machine Co., Archer, Fla., is in the market for one double-drum hoisting engine, cylinders, 7 x 9 inches; one swinging engine with double 6 x 8-inch cylinders, not a link motion. H. Maddox is president and manager.

will remodel it for the production of brass, iron and aluminum castings.

PONTIAC, MICH.—The Grand Trunk railroad is planning to erect three bridges at Pontiac to cost $60,000. G. R. Safford, Montreal, Que., is chief engineer.

SAGINAW, MICH.—The Lehr Motor Co. has been incorporated to manufacture automobiles; $500,000 capital stock; by W. M. Guider, Alfred E. Myer, Kurt M. Schwan and Harry D. Mackay.

THREE RIVERS, MICH. — The Sheffield Car Co., R. B. Lindsey, manager, will build an engine assembly building, one story, 60 x 200 feet.

CLINTONVILLE, WIS. — Articles of incorporation have been filed by the Four Wheel Tractor Co., Clinton, Wis. The capital stock is $125,000. The incorporators include Charles Topp, Levi C. Larson, Charles F. Folkman, F. M. Hyde, John Kalmes and A. B. Mayhew. Mr. Kalmes is vice president of the Four Wheel Drive Automobile Co., Clintonville, capitalized at $500,000.

GREEN BAY, WIS.—A 125-foot span bridge of the bascule or the drawbridge type will be erected over Duck creek in the town of Hoard, Brown county. It will have 50 feet clearance. Plans are now being prepared. J. Cormer is county highway commissioner.

LA CROSSE, WIS.—V. L. Page, consulting engineer, Rockford, Ill., has been engaged to prepare plans for a shop and an addition to the milling department of the La Crosse Rubber Mills Co., A. P. Funk, general manager. The building will be of brick, concrete and steel, 60 x 200 feet, two stories, and the addition will be 40 x 120 feet, two stories.

MANITOWOC, WIS. — H. Pitz, city engineer, is preparing specifications for electrical equipment for the combined waterworks pumping station and electric light plant. Bids will be asked soon. The requirements include a 750-kilowatt turbo-generator and a 500-kilowatt generator. J. J. Kelly is the city clerk.

MILWAUKEE. — The Milwaukee Athletic Club will build a club house at Broadway and Mason streets, costing $600,000.

MILWAUKEE.—The Research Laboratory Co., Milwaukee, has changed its name to the National Metal Extracting Co.

MILWAUKEE. — Stanley F. Kadaw, 988 Kinnickinnic avenue, is preparing plans for a foundry 65 x 80 feet on Clinton street to cost $10,000.

MILWAUKEE.—The electrical work on the $1,250,000 Plankinton arcade and theater building, Grand avenue, has been awarded to the L. K. Comstock Co., Chicago. Holabird & Roche, Chicago, are the architects.

MILWAUKEE.—The Stein Construction Co., Medford, Wis., is the lowest bidder at $25,970 for building a reinforced concrete and steel bridge over Milwaukee river at Silver Springs road.

MILWAUKEE. — The Northwestern Bridge & Iron Co. has taken the contract for steel work on an addition to the factory of the Quality Biscuit Co., South Pierce street and Eleventh avenue. H. Schmidt & Son are the general contractors.

MILWAUKEE, WIS.—The Kempsmith Mfg. Co., machine tools, Milwaukee, has increased its capital stock from $200,000 to $250,000 and will devote the new issue to the erection of a shop addition. Plans for the addition are now in preparation and work will begin shortly. Paul Thomas is the general manager.

In the South and Around the Gulf

THOMASVILLE, GA.—The E. T. Fields Co. is establishing a foundry in Thomasville and will be in operation at an early date. The building is located on the Albank branch on the Atlantic Coast Line railroad.

MEMPHIS, TENN. — The Illinois Central railroad, A. S. Baldwin, chief engineer, Chicago, is considering the construction of a $60,000 viaduct over its tracks at McLemore street.

RUSKIN, TENN. — The power plant of Ruskin Cave College, destroyed in a recent fire at a loss of $10,000 to $15,000, will be rebuilt at once.

ASHLAND, KY.—The Ashland Iron & Mining Co. has let a contract for a $1,000,000 open hearth steel plant which will be erected and equipped with modern appliances as rapidly as possible. In connection with this new plant the company will utilize the Ashland Sheet Mill, which has been purchased for $67,000.

LOUISVILLE, KY. — The Pennsylvania Steel Co. has taken a contract for the material for the two northern spans of the Pennsylvania railroad bridge which is to be made a double-track structure. The estimated cost of the structure is $250,000.

LOUISVILLE, KY.—Richard D. Bakrow, James G. Bakrow and U. F. L. Bakrow are the incorporators of the Puro-O-Water Filter Co., with $20,000 capital stock; and it is reported that the company is considering establishing a plant to manufacture the device for filtering and dispensing pure water.

OWENSBORO, KY.—The Recip Roto Engine Co. has been incorporated; $400,000 capital stock; by George F. Moore, T. A. Pidley and C. W. Wells.

DALLAS, TEX. — The Koehring Machine Co., recently organized, will build a machine shop. George W. Smith is interested.

FORT WORTH, TEX.—The plant of the Fort Worth Boiler Works, recently damaged by fire, will be rebuilt.

GEORGETOWN, TEX. — The city of Georgetown will install an engine and generator at the municipal electric light and water plant. R. E. Ward is manager.

HEREFORD, TEX.—The city of Hereford plans to construct central power plant on the unit system, the first unit to consist of two turbine engines, direct connected to generators of 250 horsepower each.

HOUSTON, TEX.—J. F. Lucey, president of the Lucey Mfg. Co., has bought the Union Iron Works plant and will enlarge and improve it.

TEMPLE, TEX.—The Duff-McNew Foundry & Machine Co. will increase its capacity.

Pacific Coast and Western Canada

BURNETT, CAL.—The Burnett Iron Works will enlarge its plant at a cost of $25,000.

LOS ANGELES, CAL.—The Homer Laughlin Engineering Corporation, 2652 Long Beach avenue, has increased its capital stock from $100,000 to $500,000 and will enlarge its drop forge plant.

LOVELOCK, CAL.—Bonds for $90,000 have been voted for a municipal water works.

SAN FRANCISCO, CAL. — Klieber & Co. has bought a site at Eleventh and Folsom streets and will build an addition to its factory building for the production of auto trucks.

COLFAX, WASH.—The Colfax Iron Works has bought a site for a plant and will start construction in the spring.

SEATTLE, WASH.—The city of Seattle is considering extensive water works improvements, including three turbine electric-driven, high-pressure pumps.

SEATTLE, WASH.—The Alaskan Engineering Co. is in the market for milling machines, latches, surface grinders, a wheel press, drill presses, steam chipping hammers, vises, gages, reamers, taps, etc., to be installed in connection with the government railroad in Alaska.

SEATTLE, WASH.—Henry W. Phelps, New York, vice president of the American Can Co., has announced that the company will construct its 57th branch plant in Seattle, to cost $250,000. Work will start as soon as site can be secured.

SPOKANE, WASH. — The General Machinery Co., E. J. Simmons, manager, will build a plant for the manufacture of mine accessories, cars and cages.

ASTORIA, ORE. — Plans have been approved for coal handling devices on pier 2 at an estimated cost of $37,000. F. J. Walsh is the engineer.

PORTLAND, ORE. — The Southern Pacific railroad will begin work in the spring on a steel viaduct at Holgate street, to cost $30,000.

PORTLAND, ORE.—The plant of the Electric Steel Foundry, recently damaged by fire, will be reconstructed at an estimated cost of $5,000.

NORTH VANCOUVER, B. C.—The Dominion government has approved the plans of the Amalgamated Dry Dock & Engineering Co., for the construction of a dry dock and ship building plant on the north shore. Construction work will be commenced in the near future and will include a graving dock, buildings, marine railway and equipment, etc., and will cost $5,500,000.

VANCOUVER, B. C.—Pumps & Power, 224 Abbott street, is in the market for a 15-horsepower, 3-phase motor, and a 5 to 10-horsepower steam engine.

VANCOUVER, B. C. — The contract for the erection of an addition to the American Can Co., 535 Railway street, has been let to the Dominion Construction Co., 509 Richards street, Vancouver. Contracts for elevators, electrical work installation and heating will be let at a latter date.

CALGARY, ALTA.—The Ford Motor Co. has secured a site for the erection of an assembling plant, the construction of which will commence at once.

WEYBURN, SASK.—The city council will install an additional unit to its power plant to cost $35,000. E. H. Phillips is clerk to the council.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery July 1.)

Bessemer, valley	$20.00 to 21.00
Bessemer, Pittsburgh	20.95 to 21.95
Basic, Pittsburgh	18.70 to 18.95
Basic, eastern Pa.	19.50 to 19.75
Basic, Buffalo	20.00
Malleable, Pittsburgh	19.45 to 19.95
Malleable foundry, Chicago	19.00
Malleable foundry, Philadelphia	20.50 to 20.75
Malleable foundry, Buffalo	18.50 to 19.00
No. 1X foundry, Philadelphia	20.50 to 20.75
No. 2 foundry, Pittsburgh	19.45 to 19.95
No. 2 foundry, Cleveland	19.30
No. 2 foundry, Ironton	18.00
No. 2 foundry, Chicago	18.50
No. 2X foundry, Philadelphia	20.00 to 20.50
No. 2X foundry, N. J. tidewater	20.00 to 20.50
No. 2X foundry, Buffalo	18.50 to 19.00
No. 2 plain, Philadelphia	19.50 to 20.00
No. 2 plain, N. J. tidewater	19.50 to 20.00
No. 2 plain, Buffalo	18.00 to 18.50
No. 2 southern, Birmingham	15.00 to 15.50
No. 2 southern, Cincinnati	17.40 to 17.90
No. 2 southern, Chicago	19.00 to 19.50
No. 2 southern, Phila. delivery	20.00 to 20.50
No. 2 southern, Cleveland	18.50 to 19.00
No. 2 southern, New York docks	18.50 to 19.00
No. 2 southern, Boston docks	18.25 to 18.75
No. 2 south. interior, New Eng.	18.50 to 19.50
No. 2 southern, St. Louis	18.40 to 18.90
Virginia No. 2X furnace	18.00
Virginia 2X, Philadelphia	20.75
Virginia 2X, Jersey City	21.00
Virginia 2X, Boston points	21.25
Gray forge, eastern Pa.	18.50 to 19.00
Gray forge, Pittsburgh	18.45 to 18.95
Gray forge, Birmingham	14.00
Silveries, 8 per cent, Jacksoh, O.	25.00
Silveries, 8 per cent, Chicago	27.50 to 28.00
Low phos. Standard, Phila.	32.00
Low phos. Lebanon, Pa.	29.00 to 31.00
Low phos. Pittsburgh	30.00 to 31.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	19.75 to 22.25
Charcoal, Buffalo	19.00 to 20.00
Charcoal, Birmingham	21.50

IRON ORE

Lake Superior Ores.

(Lower Lake Ports.)

Old range Bessemer, 55 per cent, ton	$4.45
Mesabi Bessemer, 55 per cent, ton	4.20
Old range non-Bes., 51½ per cent, ton	3.70
Mesabi non-Bess., 51½ per cent, ton	3.55

Eastern Ores.

(Per unit delivered eastern Pennsylvania.)

Pt. Henry fur., 60 per cent, unit.	8.6c to 8.9 c
Local N. Y. and N. J. ores, unit.	8.5c to 8.75c
Port Henry lump, at mines, ton.	$4.00

Foreign Ores.

(Per unit Philadelphia.)

(Prices nominal.)

Foreign Bess., 50 to 65 per cent	8 to 8½
For'n non-Bess., 50 to 65 per cent	8 to 8½

COKE

(At the ovens.)

Connellsville furnace	$3.50 to 3.75
Connellsville fur., contract	2.50 to 3.00
Connellsville foundry	3.75 to 4.00
Connellsville fdy. contract	3.75 to 4.00
Wise county furnace, contract	2.85 to 3.10
Wise county foundry, contract	3.25 to 3.75
Pocahontas foundry, contract	3.00 to 3.25
Pocahontas furnace, contract	2.75 to 3.25
New River, foundry contract	3.50 to 4.00
New River, furnace contract	3.00 to 3.25

FERRO ALLOYS AND STEEL MAKING METALS

Ferro mang., delivered (prompt).	$200 to 250
Ferro mang., Balti., (future)	150
Spiegeleisen 20 per cent, furnace	40.00 to 45.00
Ferro-silicon, 50 per cent, Phila.	83.00 to 85.00
Ferro silicon, 50 per cent, Pbgh.	83.00 to 85.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $27.00; 10 to 11 per cent, $28.00; 11 to 12 per cent, $29.00; 12 to 13 per cent, $30.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-chrome, 4 to 6 per cent carbon, 25 cents per pound; 2 per cent carbon, nominal.

Ferro-vanadium, nominal, Pittsburgh.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

Nickel, nominal.

Ferro-tungsten, nominal.

Cobalt metal, nominal, Pittsburgh.

Aluminum, nominal, Pittsburgh.

Ferro-molybdenum, Pittsburgh, nominal.

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive for insurance and dockage.

From New York	$0.40
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

SEMI-FINISHED MATERIAL

Open hearth billets, Phila.	$42.00 to 45.00
Bessemer billets, Phila.	36.00 to 38.00
Forging billets, Phila.	55.00 to 60.00
Forging billets, Pbgh (nominal).	55.00
Forging billets, Chgo.	50.00 to 55.00
Wire rods, Pittsburgh (nom.)	50.00
Bessemer billets, Youngstown	34.00 to 35.00
Open hearth billets, Youngstown	35.00 to 40.00
Bessemer billets, Pittsburgh	35.00 to 38.00
Open hearth billets, Pittsburgh.	35.00 to 40.00
Bess. sheet bars, Youngstown	34.00 to 35.00
Op. h'th sheet bars, Youngstown	35.00 to 40.00
Bess. sheet bars, Pittsburgh	35.00
Open h'th sh. bars, Pbgh.	35.00 to 40.00
Muck bar, Pittsburgh (nominal).	36.00 to 38.00

SKELP

Grooved steel skelp	2.25c
Sheared steel skelp	2.35c

RAILS AND TRACK MATERIAL

Stand. Bess. rails, Pbgh & Chg.	1.25c
Stand. op-h'th rails, Pbgh. & Chg.	1.34c
Light rails, 8 to 10 lbs., Pbgh.	1.85c
Light rails, 8 lb., Chgo.	1.67c
Light rails, 12 to 14 lbs., Pbgh.	1.80c
Light rails, 12 lbs., Chgo.	1.62c
Light rails 16 to 20 lbs., Pbgh.	1.75c
Light rails 16 to 20 lbs., Chgo.	1.57c
Light rails 25 to 45 lbs., Pbgh.	1.70c
Light rails 25 to 45 lbs., Chgo.	1.52c
Relaying rails, standard, Pbgh. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect., Pbgh. base.	1.50c to 1.75c
Angle bars, st. sections, Chicago	1.50c to 1.75c
Spikes, railroad, Pbgh.	2.35c
Spikes, railroad, Chgo.	2.50c to 2.65c
Track bolts, Pbgh.	2.60c
Track bolts, Chgo.	2.75c to 3.00c
Tie plates, Chgo.	45.00 to 48.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—

Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18

Buffalo to:—

Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60

Virginia furnaces to:—

Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88

Birmingham, Alt., to:—

Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75

Chicago to:—

Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58

Ironton and Jackson, O., to:—

Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

SHAPES, PLATES AND BARS

Structural shapes, Pbgh. (con.)	2.25c to 2.50c
Structural shapes, Chgo.	2.44c to 2.69c
Structural shapes, Philadelphia	2.409c
Structural shapes, New York	2.419c
Struc. shapes, San Francisco	2.00c to 2.05 c
Tank plates, Chgo.	2.54c to 3.19c
Tank plates, Pbgh. (con.)	2.35c to 2.60c
Tank plates, Philadelphia	2.509c to 3.009c
Tank plates, New York	2.519c to 3.019c
Bars, soft steel, Pbgh.	2.25c to 2.50c
Bars, soft steel, Chgo.	2.44c to 2.69c
Bars, soft steel, Pbgh. (con.)	2.00c to 2.25c
Bars, soft steel, New York	2.419c
Hoops, carloads, Pbgh.	2.50c
Bands, Pittsburgh	2.25c
Shafting, Pbgh., contr. carloads	40 off
Bar iron, Chgo.	1.95c to 2.00c
Bar iron, Philadelphia	2.409c
Bar iron, New York	2.419c
Bar iron, Cleveland	2.25 c
Bar iron, Pittsburgh	2.20c to 2.30c
Hard steel bars, Chgo.	2.00c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	2.60c to 2.75 c
No. 28, black, Chgo.	2.94c
No. 28, tin mill, black, Pbgh.	2.50 c
No. 28, galvanized, Pbgh.	4.75c to 5.25 c
No. 28, galvanized, Chgo.	5.19 c
No. 10, blue anl'd, Pbgh.	2.65c to 3.00c
No. 10, blue anl'd, Phila.	2.759c to 3.159c
No. 10, blue anl'd., Chgo.	2.94 c
Tin plate, 100 lb., coke base	$3.75 to 4.00

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickl'd, cold roll. and re-anld.	30 cents
Hot roll'd pickled and anl., tin mill.	25 cents
Full pickled, cold rolled and re-anld.	50 cents
Auto sheets	75 cents
Blue stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxiding	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free fr. mill scale	55 cents
Special open hearth deep stpg. steel, free from mill scale	80 cents
Extra deep special auto body stock.	1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black. Butt-weld.	Galv. Butt-weld.
Steel, ¾ to 3 inches	75	59½
Iron, ¾ to 1½ inches	62	43
	Lap-weld.	
Steel, 2½ to 6 inches	77	62½

BOILER TUBES

Steel, 3½ to 4½ inches l. c. l.	64
Iron, 3½ to 4½ inches, l. c. l.	53

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$2.30
Plain, wire, jobbers, Pittsburgh	2.15
Galvanized wire, jobbers', Pbgh.	2.85
Polished staples, Pbgh.	2.45
Galvanized staples, Pbgh.	3.15
Barb wire, painted, jobbers', Pbgh.	2.45
Barb wire, galv., jobbers', Pbgh.	3.15

IRON AND STEEL PRICES

Corrected up to Tuesday noon

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ¾ x 6 inches, smaller or shorter, rolled thread, 65 and 5, cut threads 65; larger or longer, 50 and 15.

Machine bolts with hot pressed nuts, ¾ x 4 inches, smaller or shorter, rolled 65 and 10; cut, 65 and 5; larger or longer, 50 and 20.

Cold pressed, semi-finished hex. nuts, 75 and 10.

Gimlet and cone point lag bolts, 65, 10 and 5. Hot pressed square, blank or tapped nuts, $3.70 off list; hot pressed hexagon blank or tapped, $3.80.

Cold pressed square, blank or tapped, $3.50 off; hexagon, blank or tapped, all sizes, $4.25.

RIVETS

Structural rivets, Pbgh	3.00c
Structural rivets, Chgo. delivery	3.10c
Boiler rivets, Pbgh	2.91c
Boiler rivets, Chgo. delivery	3.00c

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	2.25c

STANDARD STEEL CHAIN

Chain, ¾ inch proof coil	4.50c

COLD ROLLED STRIP STEEL

Base price $4.50 per 100 pounds, hard, coils 1½ inches and wider and by .100 inches and heavier.

Extras.

.10 to .19 carbon. 1½ inches and wider.

Coils.

	Hard.	Soft.
0.100 and heavier	Base	$0.25
0.050 to 0.099	$0.05	0.30
0.035 to 0.049	0.20	0.45
0.031 to 0.034	0.35	0.75
0.025 to 0.030	0.45	0.85
0.020 to 0.024	0.55	0.95
0.017 to 0.019	1.35	1.35
0.015 to 0.016	1.75	1.75
0.013 to 0.014	2.45	2.45
9.012	2.80	2.80
0.011	3.15	3.15
0.010	3.50	3.50

Lengths 24 Inches and Over.

	Hard.	Soft.
0.100 and heavier	$0.10	$0.35
0.050 to 0.099	0.20	0.45
0.035 to 0.049	0.35	0.60
0.031 to 0.034	0.60	1.00
0.025 to 0.030	0.85	1.25
0.020 to 0.024	1.05	1.45
0.017 to 0.019	2.45	2.45
0.015 to 0.016	2.85	2.85
0.013 to 0.014	3.70	3.70
0.012	4.30	4.30
0.011	4.65	4.65
0.010	5.00	5.00

Extras as per card of Jan. 1, 1916.

CAST IRON WATER PIPE

Four-inch, Chicago	$32.50 to 33.00
Six-inch and larger, Chicago	29.50 to 30.00
Six-inch Class B, New York	29.50
Four-inch, Class B, New York	32.50
Four to six-inch, Birmingham	27.00 to 28.00
Six-inch and larger, Birmingham	25.00

Light weight water and gas pipe, $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	2.75c
Steel squares, 2-in. & ov., Cleve.	2.95c
Steel rounds, 2 in. and over	3.20c
Steel bars, under 2 in., Cleveland	2.70c
Steel bars, Philadelphia	2.60c
Steel bars, New York	2.95c
Steel bars, St. Louis	2.80c
Steel bars, Cincinnati	2.65c to 2.70c
Steel bars, St. Paul	2.85c
Steel bars, over 2-inch, Buffalo	3.15c
Steel bars, Buffalo	2.70c
Iron bars, Chicago	2.30c
Iron bars, Cleveland	2.65c
Iron bars, St. Louis	2.60c
Iron bars, Cincinnati	2.60c to 2.65c
Iron bars, Philadelphia	2.60c
Iron bars, New York	2.95c
Shapes, Chgo.	2.75c
Shapes, St. Louis	2.80c
Shapes, St. Paul	2.85c
Shapes, New York	2.95c
Shapes, Cleveland	2.70c
Shapes and plates, Buffalo	2.45c
Shapes and plates, Cincinnati	2.60c to 2.70c
Plates, Chgo.	2.95c
Plates, St. Louis	3.00c
Plates, St. Paul	3.05c
Plates, New York	3.50c
Shapes, Philadelphia	2.50c
Plates, Cleveland	2.85c
Plates, Philadelphia	2.75c
No. 10 blue anl. sheets, Chgo.	2.95c
No. 10 blue anl. sheets, Clevel'd	3.25c
No. 10 blue anl. sheets, Buffalo.	3.25c
No. 10 blue anl. sheets, St. Louis	3.00c
No. 10 blue anl. sheets, Cinci.	3.25c
No. 10 blue anl. sheets, St. Paul	3.05c
No. 28 black sheets, Chgo.	3.00c
No. 28 black sheets, Cleveland.	2.95c
No. 28 black sheets, Cincinnati.	3.00c
No. 28 black sheets, St. Louis.	3.20c
No. 28 black sheets, St. Paul	3.25c
No. 28 galv. sheets, Chgo.	4.80c to 5.00c
No. 28 galv. sheets, Cleveland.	5.25c
No. 28 galv. sheets, Cincinnati.	5.25c
No. 28 galvanized sheets, St. L.	5.25c to 5.50c

Freight Rates, Coke

Connellsville district, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.85
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

Arch bars and transoms, Chgo.	$18.00 to 18.50
Arch bars and transoms, St. L.	18.00 to 18.50
Angle bars, iron, Chicago	17.25 to 17.75
Angle bars, steel, St. Louis	13.50 to 14.00
Arch bars and transoms, Chgo.	18.00 to 18.50
Arch bars and transoms, St. L.	16.50 to 17.00
Cut forge, Chicago	14.00 to 14.25
Knuckles, coup., Chgo	15.50 to 16.00
Springs	16.00 to 16.25
Knuckles, coup., St. L.	15.50 to 16.00
Locomotive tires, Chicago	16.00 to 16.50
Locomotive tires, St. Louis	15.00 to 15.50
Railroad wrought, No. 1, Chgo.	14.75 to 15.25
Railroad wrought, No. 1, Cleve.	18.00 to 18.50
Railroad wrought, No. 1, St. L.	14.50 to 15.00
Railroad wrought, No. 1, Cinci.	12.50 to 13.00
Railroad wrought, No. 2, Chgo.	14.00 to 14.25
Railroad wrought, No. 2, St. L.	14.50 to 15.00
Shafting, Chgo.	17.00 to 17.50
Shafting, St. Louis	17.00 to 17.50
Springs, Chgo.	16.25 to 16.50
Steel car ales, B'ham	14.50
Steel car axles, Chicago	21.75 to 22.25
Steel car ales, St. Louis	21.00 to 22.00
Pipes and flues, Chicago	10.75 to 11.25
Pipes and flues, Cleve'd (nom.)	13.00 to 13.75

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—	
New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Minneapolis and St. Paul	32.9 cents
Denver	68.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Boiler plate, cut, No. 1, Chgo.	11.50 to 12.00
Boiler plate, cut, No. 1, St. L.	7.00 to 7.50
Boiler punchings, Chicago	14.00 to 14.50
Busheling, No. 1, Chicago	11.75 to 12.25
Busheling, No. 1, Cleveland	14.00 to 14.50
Busheling, No. 1, Cincinnati	10.25 to 10.75
Busheling, No. 1, St. Louis	11.50 to 12.00
Busheling, No. 2, Chicago	8.75 to 9.25
No. 1 cast	13.00 to 13.50
Bundled sheet, Cincinnati	8.50 to 9.00
Cast, No. 1, Cleveland	14.25 to 14.75
Cast, No. 1, Cincinnati	11.50 to 12.00
Cast, No. 1, St. Louis	9.50 to 10.00
Cast No. 1, Chicago	13.00 to 13.50
Cast borings, Chicago	7.25 to 7.75
Cast borings, Cleveland	8.50 to 8.75
Cast borings, Cincinnati	7.50 to 8.00
Cast borings, St. Louis	7.00 to 7.50
Machine shop turnings, Chgo.	8.00 to 8.50
Machine shop turnings, Cleveland	7.25 to 7.50
Machine shop turnings, Cinci.	7.00 to 7.50
Machine shop turnings, St. L.	8.00 to 8.50
Malleable agricultural, Chgo.	12.00 to 12.50
Malleable agriculture, St. Louis	10.50 to 11.00
Malleable railroad, Chicago	14.25 to 14.50
Malleable, Cincinnati	8.50 to 9.00
Malleable railroad, St. Louis	12.00 to 12.50
Pipes and flues, Chgo.	11.75 to 12.25
Pipes and flues, St. Louis	10.50 to 11.00
Stove plate, Chicago	11.00 to 11.50
Stove plate, Cleveland	10.25 to 10.75
Stove plate, Buffalo	9.50 to 10.00
Stove plate, Cincinnati	8.00 to 8.50
Stove plate, St. Louis	9.50 to 10.00

(Gross tons.)

Boiler plate sheared, Buffalo	13.00 to 13.50
Busheling, No. 1, Buffalo	13.50 to 14.00
Busheling, No. 1, Pbgh	14.50 to 15.00
Busheling, No. 2, Buffalo	11.00 to 11.50
Bundled sheet, Pittsburgh	14.50
Bundled sheet, Cleveland	12.75 to 13.25
Bundled sheet, Buffalo	12.00 to 12.50
Car wheels (iron), Pittsburgh	15.50 to 16.00
Car wheels (steel), Pittsburgh	18.00 to 18.50
Car wheels, Chicago	13.75 to 14.00
Car wheels, eastern Pa.	16.00 to 16.50
Car wheels, Buffalo	15.25 to 15.75
Car wheels, N. Y.	14.00 to 14.50
Car wheels, St. Louis	13.00 to 13.50
Cast borings, New York	9.00 to 9.25
Cast borings, eastern Pa.	11.50 to 12.00
Cast borings, Buffalo	9.25 to 9.75
Cast borings, Pittsburgh	11.25 to 11.50
Cast, No. 1, eastern Pa.	17.50 to 18.00
Cast, No. 1, Pittsburgh	16.00 to 16.25
Cast, heavy No. 1, N. J. points	16.50 to 17.00
Forge, No. 1, eastern Pa.	14.00 to 14.50
Frogs, switches, guards, Chgo.	15.00 to 15.50
Frogs, switches, guards, St. L.	15.25 to 15.75
Grate bars, Buffalo	11.00 to 11.50
Grate bars, N. J. points	13.25 to 13.50
Heavy axle turnings, Buffalo	12.00 to 12.50
Heavy melting steel, Pbgh	17.00 to 17.50
Heavy melting steel, Buffalo	16.50 to 17.00
Heavy melting steel, Chicago	15.00 to 15.50
Heavy melting steel, Cleveland	16.25 to 16.75
Heavy melting steel, Cincinnati	13.75 to 14.25
Heavy melting steel, eastern Pa.	16.50 to 17.00
Heavy melting steel, New York	14.25 to 14.50
Heavy melting steel, St. Louis	15.25 to 15.75
Iron rails, Chicago	17.00 to 17.50
Iron rails, Buffalo	17.00 to 17.50
Iron rails, Cincinnati	14.00 to 14.50
Iron rails, St. Louis	16.00 to 16.50
Iron rails, Cleveland (nom.)	17.00 to 18.00
Iron axles, Pittsburgh	25.00 to 26.00
Iron axles, Cincinnati	20.25 to 20.75
Iron axles, eastern Pa.	26.00 to 27.00
Iron axles, Chgo.	23.50 to 24.00
Iron axles, Buffalo	23.00 to 23.50
Iron axles, St. Louis	22.25 to 22.50
Low phos. steel, Buffalo	20.50 to 21.00
Low phosphorus steel, Pbgh	21.50 to 22.00
Low phos. steel, eastern Pa.	22.00 to 23.00
Machine shop turnings, Buffalo	7.75 to 8.25
Mch. shop turnings, New York	8.00 to 8.50
Mch. shop turnings, Pbgh	9.25 to 9.75
Mch. shop turnings, eastern Pa.	10.75 to 11.00
Mall. railroad, Cleveland	16.25 to 16.50
Malleable railroad, Pittsburgh	16.25 to 16.50
Malleable railroad, Buffalo	15.25 to 15.75
Malleable railroad, eastern Pa.	14.50 to 15.00
R. R. and mch. cast, No. 1, Bfl.	15.25 to 15.75
R. R. wrought, No. 1, Buffalo	17.50 to 18.00
Railroad wrought, No. 1, E. Pa.	22.00 to 23.00
R. R. wght., No. 1, New York	20.50 to 21.00
Railroad wrought, No. 1, Pbgh	19.00
Reroll. rails, 5 ft. & ov., Pbgh	18.00 to 18.50
Reroll. rails, 5 ft. & ov., Chgo.	17.00 to 17.50
Reroll. rails, 5 ft. & ov., Cleve.	16.25 to 16.75
Reroll. rails, 5 ft. & ov., E. Pa.	19.00 to 20.00
Reroll. rails, 5 ft. & ov., St. L.	17.50 to 18.00
Shafting, New York	19.00 to 19.50
Shafting, eastern Pa.	23.00 to 23.50
Shoveling steel, Chicago	14.75 to 15.00
Shoveling steel, St. Louis	14.00 to 14.50
Steel rails, short, Chicago	16.50 to 17.00
Steel rails, short, Cleveland	18.25 to 18.50
Steel rails, short, St. Louis	15.25 to 15.75
Steel car axles, New York	22.00 to 23.00
Steel car axles, Buffalo	23.00 to 23.50
Steel car axles, Cleveland	24.00 to 24.50
Steel car axles, eastern Pa.	24.00 to 25.00
Stove plate, N. J. points	13.25 to 13.50
Stove plate, Pittsburgh	11.50 to 12.00
Stove plate, eastern Pa.	12.50 to 13.00
Wrought pipe, New York	13.25 to 13.50
Wrought pipe, Buffalo	13.00 to 13.50
Wrought pipe, eastern Pa.	15.25 to 15.75

Opportunities

POSITIONS OFFERED
Minimum ad. set solid, 50 words $1.00
Minimum ad. all caps, 50 words $1.50

POSITIONS WANTED
Minimum ad. set sold, 25 words $.50
Minimum ad. all caps, 25 words $.75

(Each additional word set solid, 2c.—Each additional word all caps, 3c.)

Positions Offered

WANTED AT ONCE, SEVERAL FIRST class draftsmen of general mill and blast furnace experience. State age, experience, present salary and salary wanted in first letter; also when available. Central location Pittsburgh. Address Box 749, THE IRON TRADE REVIEW, Cleveland, O.

WANTED AT ONCE, SEVERAL DRAFTSMEN experienced in power plant and general piping work. State experience, present salary and salary wanted in first letter; also when available. Central location Pittsburgh. Address Box 750, THE IRON TRADE REVIEW, Cleveland, O.

UNDERSIGNED COUNSEL WILL CONFIDENTIALLY negotiate preliminaries for important executive, technical, administrative and professional positions, insuring strictest privacy. Not an agency, but a highly-endorsed, high grade method of negotiating preliminaries only, for $2,000 to $12,000 men. Send address only for explanation. R. W. Bixby, F1 Niagara Square, Buffalo, N. Y.

WE WANT TO GET IN TOUCH WITH a first class steel salesman. Our output is electric alloy steel in ingots, billets and bars.

A record of actual sales in this specialty and a good personal acquaintance with its uses and users is essential. Replies must give sufficient particulars along the above lines, including references. Confidential handling is assured; references will not be approached until after definite agreement.

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THE BEST WAY TO GET A GOOD position in drafting or engineering is to file an application direct with some of our clients who are depending on us to get competent and experienced applicants for their vacant positions. Send stamp for blank and list of vacant positions. The Cleveland Engineering Agency Co., Rose building, Cleveland, O.

WANTED:—FOREMAN FOR FOUNDRY manufacturing harvesting machinery and plows. Must thoroughly understand mixing of iron by analysis; must also be familiar with chilling process used on plows. Applicant must be temperate in habits, of good clean character, aggressive, and above all a good executive. State age, years of experience and where present employed. All recommendations and correspondence treated confidentially. Address Box 785, THE IRON TRADE REVIEW, Cleveland, O.

Positions Offered

WANTED: — SUPERINTENDENT FOR 3-Furnace Malleable Iron Shop. Prosperous business. Good organization. Full of work. Superintendent leaves to engage in different business. St. Louis Malleable Casting Co., 7800 N. Broadway, St. Louis, Mo.

WANTED:—FOREMAN—BENCH MOLDING Steel Castings. Must be familiar with Manganese steel castings and capable of producing nice clean work. State age, experience and salary. Address Box 784, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — 3 HEATERS. 3 YEARS foreign engagement, wages $150 per month. Address Box 788, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—CHEMIST AS AN ASSISTANT in iron and steel laboratory. Pittsburgh district. State full particulars and salary expected. Address Box 792, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — STEEL BLOWER, FAMILIAR with Whiting cupolas and able to handle exacting proposition. Advise experience and salary expected. Address Box 791, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

BLAST FURNACE SUPERINTENDENT, competent, successful and up-to-date in furnace practice. For 10 years making Bessemer iron. Now employed at a record breaking plant making basic iron. Wishes position with a company appreciating good work. Can refer you to past and present employer. Address Box 755, THE IRON TRADE REVIEW, Cleveland, O.

AS WORKS MANAGER, GENERAL Superintendent or Systematizer of gray iron or car wheel foundry. Thoroughly posted as to cupola practice, melting by analysis; good organizer with energy; can reduce your costs and increase your output. A-1 references. Address Box 786, THE IRON TRADE REVIEW, Cleveland, O.

SALES MANAGER:—OF LONG EXPErience would like to connect with some good manufacturing concern. Capable of assuming full charge of business management. Full particulars furnished interested parties. Personal interview preferred. References, former employers and others. Address Box 793, THE IRON TRADE REVIEW, Cleveland, O.

YOUNG MAN DESIRES POSITION IN steel trade, willing to go into mill, with opportunity to get into sales department. Have had three years experience in forging business, two years as assistant to superintendent of forge shops. Can furnish best of references. Address Box 762, THE IRON TRADE REVIEW, Cleveland, O.

AS BLAST FURNACE SUPERINTENDent or Assistant, up-to-date man; at present employed with large concern. Age 33 years; 10 years experience Merchant and mill irons smelting all grades of ores. Technical graduate; undeniable references regarding ability, etc., from successful furnacemen. Practical from the keeper up. Location no object. Address Box 774, THE IRON TRADE REVIEW, Cleveland, O.

STRUCTURAL STEEL, ORNAMENTAL iron and reinforced concrete engineer and estimator desires engagement with a company requiring the services of an A-1 man. Address Box 795, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

COMPETENT BLAST FURNACE SUPERintendent, technically trained; twelve years experience in modern and efficient practice, management and operation with large plant. Thoroughly understand ores, amount of temperature, blast and material required to produce different kinds of iron. Well versed in modern practice. Desire change; investigate my record. Address Box 764, THE IRON TRADE REVIEW, Cleveland, O.

ORNAMENTAL IRON AND STRUCTUral steel man; desires connection with iron or steel works, graduate civil and mechanical engineer. Can take financial interest and devote all my time to the business. Experienced in selling and contracting for building products, bridges and reinforcing steel, competent designer and estimator. Address Box 742, THE IRON TRADE REVIEW, Cleveland, O.

FOREMAN NOW EMPLOYED, WISHES to make change; have 20 years' experience as pattern maker and foreman, draftsman and designer; last four years in charge of designing, experimental and pattern departments with a large brass firm. Thoroughly up to date on modern shop practice. Address Box 707, THE IRON TRADE REVIEW, Cleveland, Ohio.

MASTER MECHANIC OR SHOP FOREman: Experienced in steel plant, sheet mill, general repair shops, clay-working machinery. Now superintendent small machine shop and foundry. Expert mechanic, efficiency man. Address Box 747, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED BY MALLEABLE superintendent who can produce results. Full particulars Address Box 787, THE IRON TRADE REVIEW, Cleveland, O.

WHEN YOU NEED A HIGH GRADE executive, engineer, draftsman, or any technical man, consult The Engineering Agency, Inc., (Est. 21 years) 1662 Monadnock Block, Chicago.

AS FOUNDRY SUPERINTENDENT OR manager; graduate in metallurgy and mix by analysis; have wide experience on loams dry and green sand in brass, bronze, steel and iron; expert on molding machines and metal plates, estimating; wood and metal pattern-making; spent 5 years as chief foundry engineer and adviser in U. S. navy yard; age 37, married; can furnish highest references. Address Box 767, THE IRON TRADE REVIEW, Cleveland, O.

AS BAR OR GUIDE ROLLER; OPEN for position either iron or steel; bar mill preferred; can furnish first-class references. Strictly temperate and a hustler. Address Box 773, THE IRON TRADE REVIEW, Cleveland, O.

WANTED — TO HEAR FROM FIRM desiring service of labor foreman, steel blower, turn foreman, converting open hearth blowing mills. Address Box 780, THE IRON TRADE REVIEW, Cleveland, O.

DRAFTSMAN 31, WITH GOOD EXPErience in design of Rolling Mills and open hearth furnaces, desires position. Machine shop experience and technical training. Address Box 782, THE IRON TRADE REVIEW, Cleveland, O.

POSITION AS BLOWER OR IRON Foreman by a blast furnaceman of good education and wide experience. Excellent references. Address Box 763, THE IRON TRADE REVIEW, Cleveland, O.